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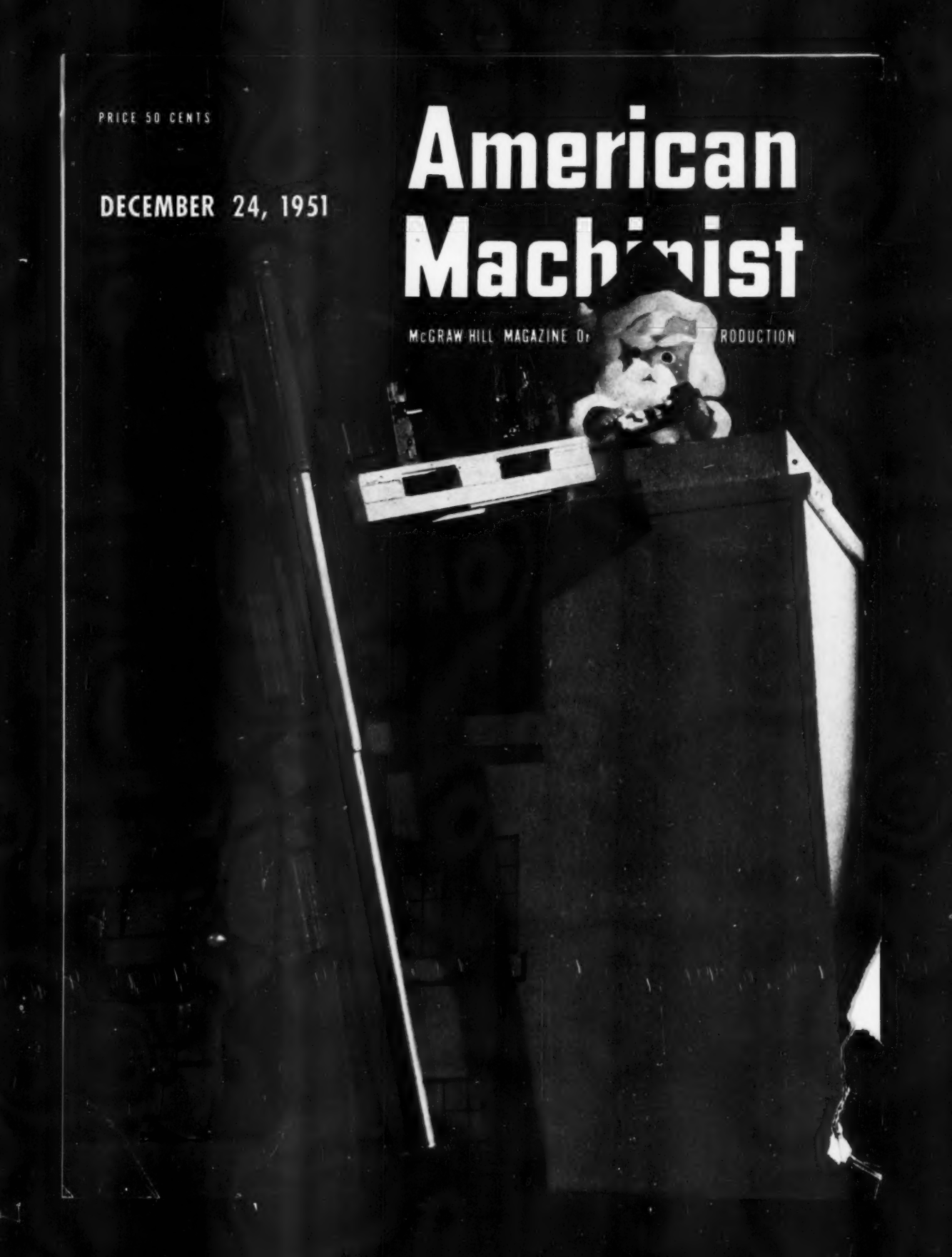

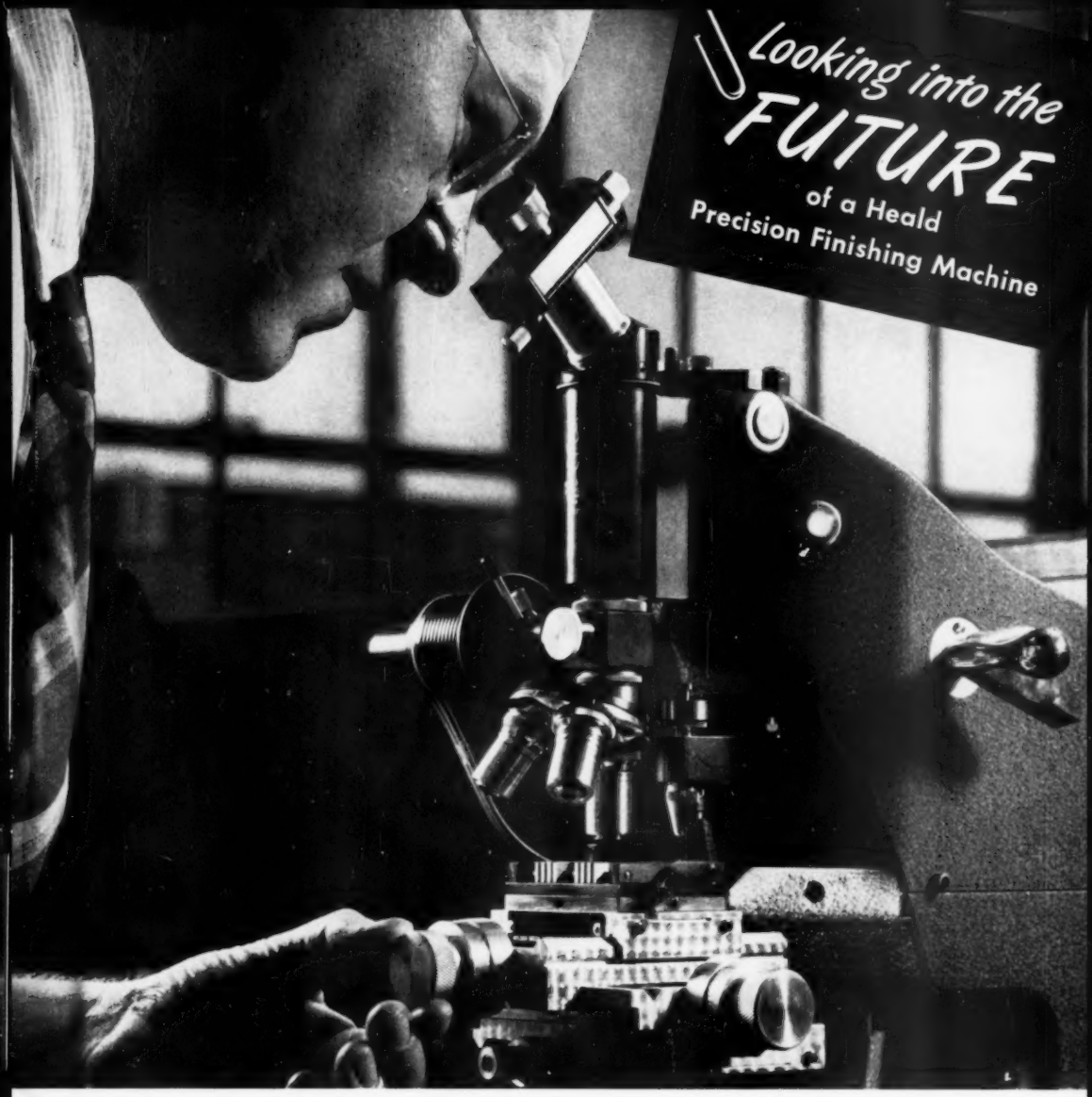

Looking into the FUTURE of a Heald Precision Finishing Machine

THERE'S no guesswork about predicting the performance of a Heald machine. Heald engineers see to that—literally as well as figuratively. Here, for example, a skilled technician examines metal surfaces which have had the Tukon hardness test. Whether these metals are to be *used* in a Heald machine—or are to be *precision finished* on a Heald machine—the end result of this painstaking research is the same. More *precision* for your future production of essential machines and components. This is just one of the endless tests carried on in Heald's research department, to keep Heald Bore-Matics, Internal Grinding Machines and Rotary Surface Grinding Machines years ahead in design and performance.

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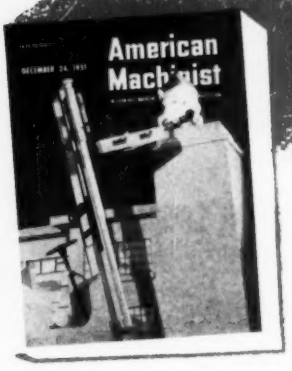


Chips and QUIPS

MERRY CHRISTMAS . . . Our current-issue date of Christmas Eve suggested that we convey suitably to you our sincerest wishes for a merry Christmas and a happy New Year. Machine tools came to mind as the probable most-wanted—and least-likely to-be-gotten—present. So we have Santa, using modern handling equipment instead of his overworked reindeer, bringing them to you, himself handing down a turret lathe. It's unlikely to happen, but we can all dream and hope, a little, at Christmas.

The lift truck in the picture is a mockup model loaned us by Yale & Towne (by private car from Philadelphia), the machine tools are from Comet Metals Products Co., Richmond Hill, N. Y., and Santa himself was dressed by Doris Rooman from a dime-store doll. The building, and photograph were made in the McGraw-Hill Studio.

RADIOACTIVE SHORTCUT . . . Last June, we first saw the setup for studying tool life at Cincinnati Milling Machine Company described in this issue. It's a new idea—a radioactive toolbit. 97% of the worn particles from the bit cling to the chips, and because of their radioactivity, can be Geiger-counted. That slashes time and material for tests. Success of the method was first reported in our issue of Nov. 12 (p 181).

ASSEMBLY ON WHEELS . . . Dayton Pump has doubled production from 20% less floor space—and with 25% less manpower—by coordinated conveyorized assembly. The new setup replaces straight-line progressive assembly, is broadly applicable. Louis Wozar and Charles Rike explain it.

HORSE'S MOUTH . . . "Never look a gift horse in the mouth" is good advice on Dec. 24. If you must look, at least know what you are looking for. The same advice applies to screwthreads. In Oct. 15 *AM* we outlined thread specifications and various measuring methods. Now we bring you another roundup Special Report (last in the series on threading) to describe methods for determining assemble-ability. This is not measurement, but comparison, using plug gages, ring gages, and the many tools which have grown from them. In addition, there's a section on setting up a system for production inspection.

FOR TOOL MEN . . . Several short articles in this issue will be Christmas ideas for tool engineers. . . . Martin Heinrich describes a lathe converted for hobbing teeth in tubular racks at Delta Power Tool. . . . Federico Strasser of Chile discusses die clearance tests which show acceptable holes can be produced even though the clearance is 25 times handbook values—he suggests it's time for a thorough investigation. . . . Then there's a page picturing some unusual heavy-machining operations at Canadian Allis-Chalmers, and for contrast two pages describing ingenious miniature milling heads at American Allis-Chalmers which mill blind keyways in bores.

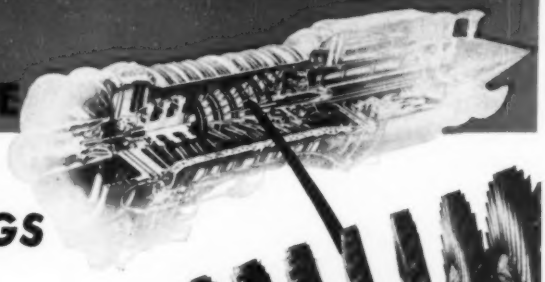
BABY TEETH . . . More than a year ago, our publication of a Special Report on gear cutting brought a protest from some of the fellows who make miniature gears. Our story didn't cover their equipment. They were right; miniature precision gears are a special problem. In this issue, we've taken four pages to show the problem and its solution—a picture-caption round-up.

SPECIAL COIL . . . Crosley needed a special coil (called a deflection yoke) for television sets, found it could be wound to approximate shape, then finish-formed. J. W. Whetsel, process engineer, describes the special machine that does the job and cuts out two forming operations and 45% of the cost.

COMING . . . Your first *AM* of the new year, dated Jan. 7, will carry a spick-and-span cutter-grinding room on its cover. Our Special Report will explain how to save top-grade HSS by brazing it on shanks; a feature article will cover high-speed machining of stainless. Other articles will cover mist-cooling in brass machining, flame and induction hardening, the new Watervliet investment-casting foundry, and gage control at Electromotive Diesel. There'll be shorts too.

PRODUCTION SPECIALIST . . . Eric Preece, works manager of Fairchild Engine Div, Fairchild Engine & Airplane Corp, received most of his formal engineering education, including apprenticeship as a toolmaker, in England. Shortly after World War I he came to the US and joined Ford Motor Company. Following a period as a foreman at Ford, he took a position at the Curtiss Aeroplane Company. He spent 19 years with Curtiss and Curtiss-Wright, joining the rapidly growing Wright Aeronautical Corporation. At Wright Aero he was [illegible] of Experimental Methods, manager of [illegible] mfg, then production manager. Eric left Wright in 1944 to do a tour of service in Europe, then went to South America as assistant to the president of Fabrica Nacional de Motores, Brazil. Here he was largely responsible for manufacturing the first aircraft engine built in Brazil. In 1947, he joined Fairchild. In this issue, he describes planning for the recent move to additional quarters.

AIRCRAFT GAS TURBINE ENGINES USE INTERCHANGEABLE GLEASON CURVIC® COUPLINGS



Note this compressor rotor for an aircraft gas turbine engine with its individual precision discs. Curvic couplings between each stage carry the torque load and accurately center the separate members.

Ground Curvic® and Zerol face couplings are produced automatically on the Gleason No. 19 Curvic® Coupling Grinder with a uniformity which makes each part interchangeable. Use of self-centering built up sections, perfectly aligned through fixed coupling teeth, simplifies manufacture and materially facilitates reassembly of large units to their original standard of precision.

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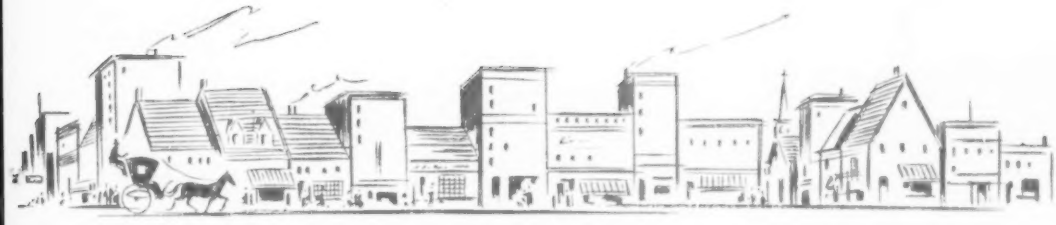
GLEASON WORKS

1000 UNIVERSITY AVENUE · ROCHESTER 3, NEW YORK

Greetings

The folks
at Cincinnati Milling
extend Season's Greetings
and best wishes
for a happy, healthy,
and prosperous year.



THE CINCINNATI MILLING MACHINE CO.
CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO
World's Largest Builders of Fine Machine Tools

BIG '36' GEAR SHAPER cuts

- The quick assumption that a machine with 36" dia. x 6" face width capacity would not be efficient on small gears... IS WRONG!

Here is specific evidence to the contrary:

PHOTO BY COURTESY
NATIONAL ACME COMPANY
CLEVELAND, OHIO
Makers of Multiple-Spindle Bar and Chucking Machines

GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS

PLASTICS MOLDING MACHINES

SMALL GEARS faster, too!

SPECIFICATIONS:
STEEL SAE 4150
PITCH 8/10
PRESSURE ANGLE 20°
NO. OF TEETH 47
HELIX ANGLE 23°
TOOTH DEPTH .235"
6.075"
Cutting Time:
10 Minutes . . on the new
36-Type Gear Shaper
17.2 minutes . . . . . by next best alternate method
24 minutes . . . . . on still another machine
(all methods @ 2 gears per load, one cut)

This super-rigid big machine can take heavy cuts at high speed, and still hold fine finish . . . Work can be stacked up to 6" face width. Quick set-up, via shift-lever, dial-set and push-button controls. Choice of 12 cutter spindle speeds (18 to 300 strokes per min.) and 12 rotary feeds . . . The most versatile of all-purpose Gear-shapers! . . . *Contact our nearest representative for additional information. He will be glad to assist you in lowering your gear production costs.*

Fellows

THE FELLOWS GEAR SHAPER COMPANY • Head Office and Export Department • 78 River Street, Springfield, Vermont
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The Van Norman No. 38 Miller gives you many cost-cutting advantages not found in any other miller of this type. The heavy, rugged column and sturdy ram are constructed to take all types of cuts including carbide milling. The massive cutterhead has a 10 HP motor driving the spindle, providing a 100% increase in power. Cutterhead speeds have been increased to 2000 RPM for high speed work.

It will pay you to investigate the advantages of this New No. 38. Check its features against other millers and you'll find it gives you greater opportunities to cut costs and increase production. Write for information.

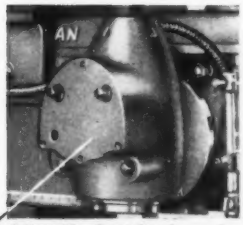
Production Work Hours . . .

VAN NORMAN

No. 38

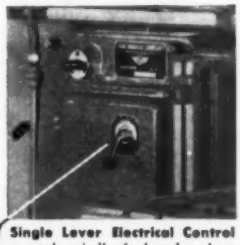
RAM TYPE MILLING MACHINE

A Heavy-Duty Miller that provides many cost-cutting advantages



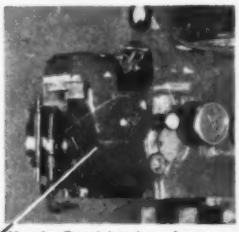
Adjustable Cutterhead permits horizontal, angular and vertical milling on *one* machine. Graduated in degrees for easy positioning.

Front and Rear Controls of all power feeds can be operated from either position. Manual controls are also at front and rear.

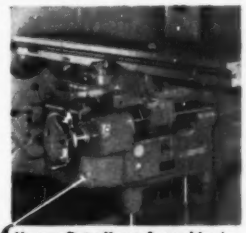


Single Lever Electrical Control controls spindle, feed, and coolant. The same lever reverses spindle direction.

Load Meter is right before the operator's eyes . . . gives visual indication of the "percent of load" that the machine is being operated under.



Massive Ram is heavier and stronger than on other machines. It is reinforced throughout for ruggedness and long life.

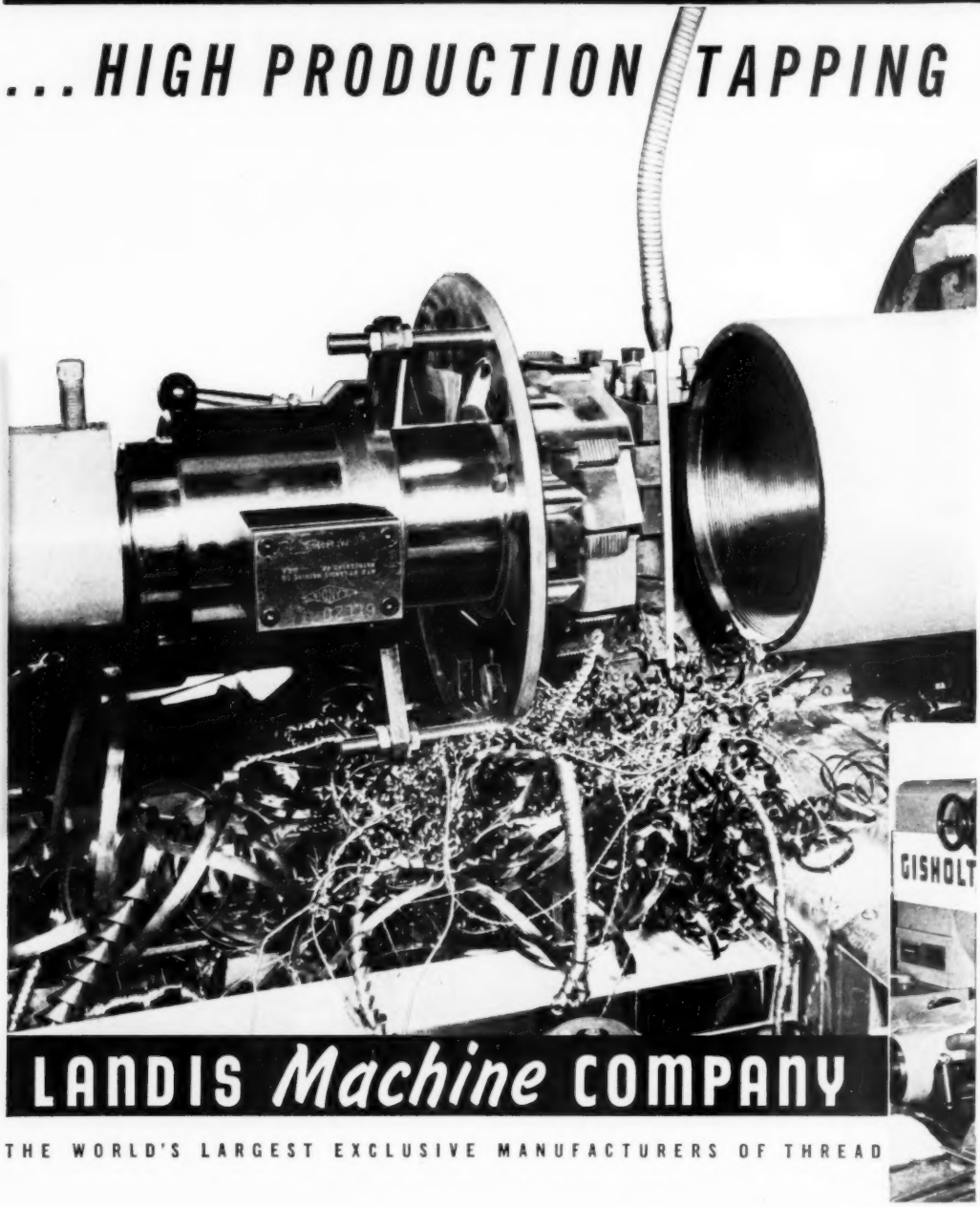


Heavy-Duty Knee Assembly, including table and saddle, is designed as an integral unit to provide maximum rigidity and accuracy.

VAN NORMAN COMPANY
SPRINGFIELD 7, MASSACHUSETTS

Internal Threads Tapped

...HIGH PRODUCTION TAPPING



LANDIS *Machine* COMPANY

THE WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF THREAD

to A. P. I. Tolerances . . .

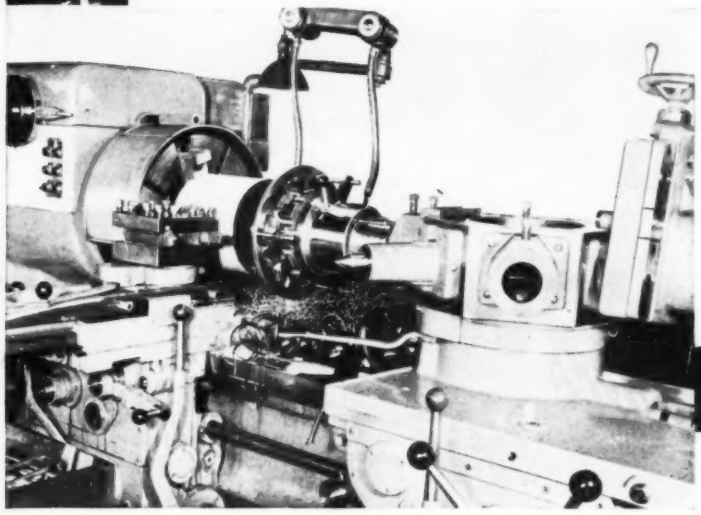
STANDS RIGID "100% INSPECTION"

Casing couplings are subjected to enormous strains created by the weight of the suspended casing, as well as to tremendous internal and external pressures. For these reasons they require threads of extreme accuracy. Thus the prime consideration in the selection of equipment for the production of these threads is that it produce A.P.I. threads at economical production rates.

The operation shown here is one of many where internal tapered threads are cut to A.P.I. tolerances at high production rates by Landis LL Receding Collapsible Taps. 8 pitch round form threads are cut in Grade N80 casing couplings 10¾" in diameter to a length of 4" with a ¾" taper. Production is high—averaging consistently about 17 surface feet per minute. A.P.I. tolerances are met without difficulty.

Landis LL Receding Collapsible Taps are designed and built for this type of work. The receding mechanism causes the chasers to recede into the tap head automatically at a rate equal to the taper of the thread being cut. When the thread is completed the chasers collapse into the tap head, and the tap is withdrawn.

Each tap has a wide range of cutting diameters since the tap heads are detachable and interchangeable. For example, if furnished with appropriate heads, the 6LL Tap Body, shown here equipped with a 10" ALM Tap Head will cut threads in all pipe sizes ranging from 6" to 12" inclusive. The Style LL Tap Body is made in four sizes to cover a range of nominal pipe sizes from 1" to 12" inclusive.



Write for Bulletin G-95

LANDIS STYLE LL RECEDING COLLAPSIBLE TAP

WAYNESBORO PENNA., U. S. A.

GENERATING EQUIPMENT

HOW OPERATOR CONVENIENCE PAYS OFF

on new LANDIS TOOL 10"-14" plain grinders

- Centralized controls save set-up time
- Arms-length controls less tiring
- Grouped for normal operating sequence
- Less operator skill required

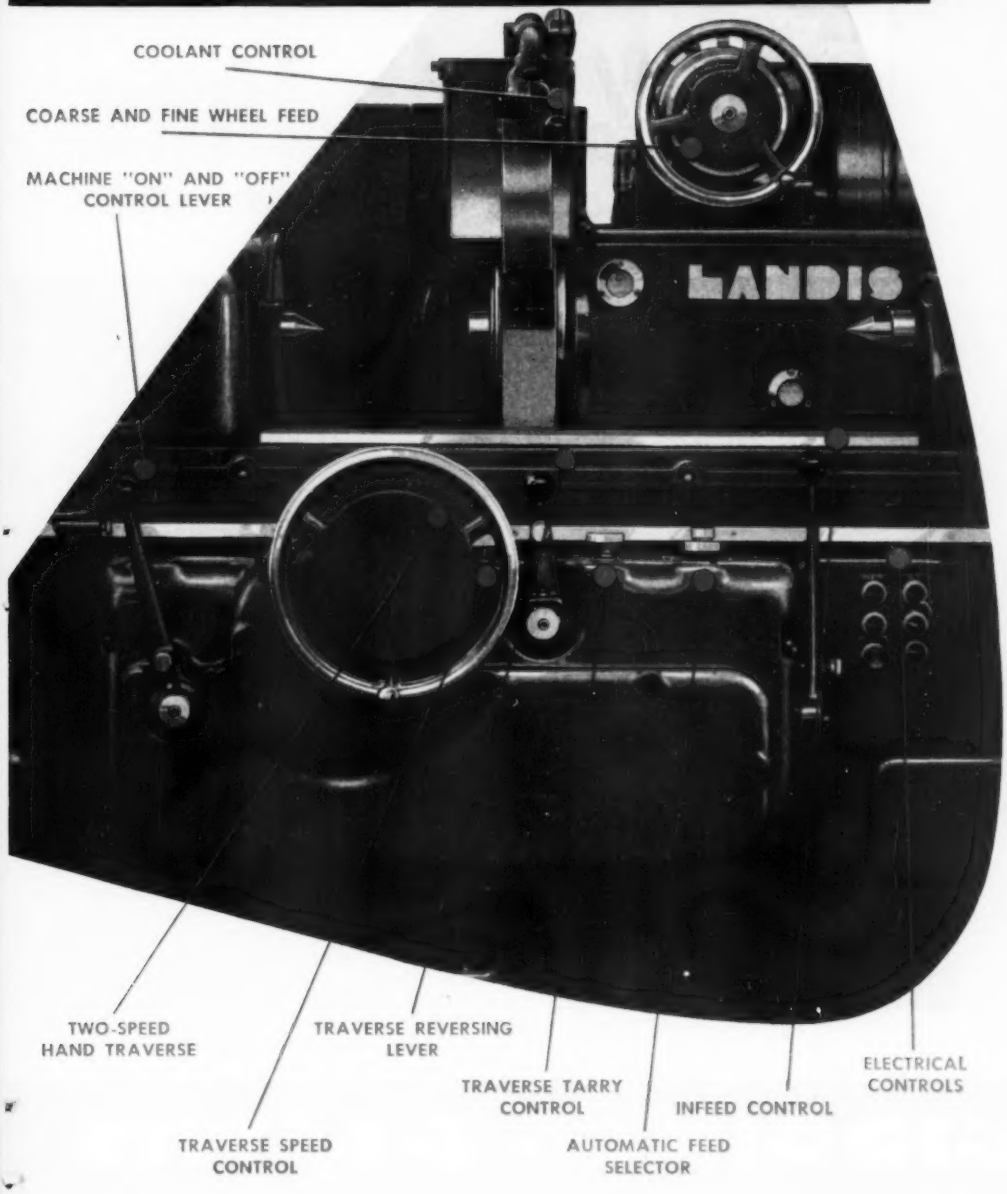
LANDIS TOOL 14" x 48" Type CH
Plain Grinder. Catalog B50

135

LANDIS TOOL *Precision Grinders*

Send us your work prints for study and let our production estimates show how you can increase your cylindrical grinding out-put.

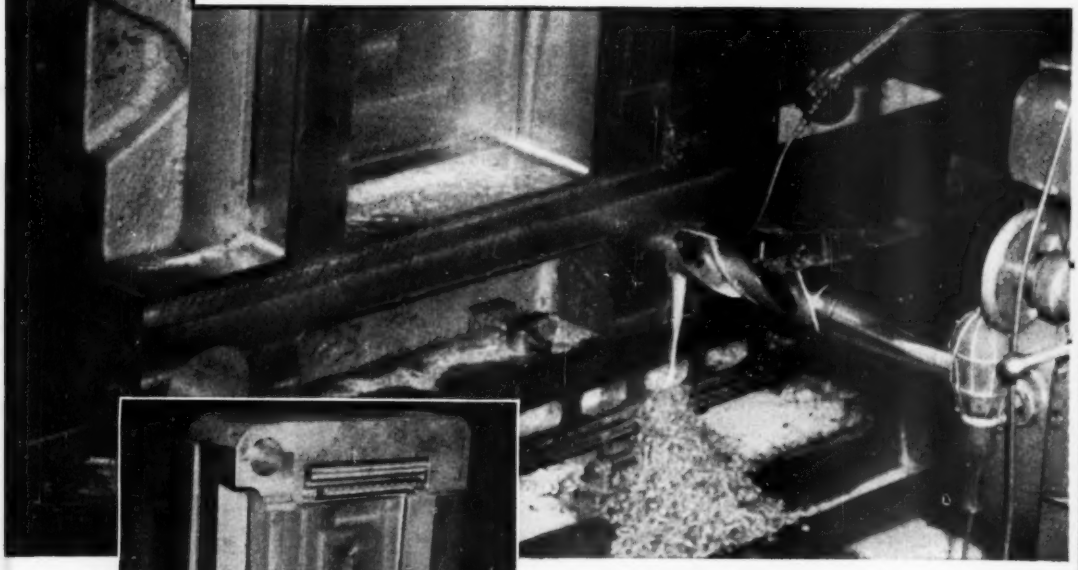
IN HIGH GRINDING PRODUCTION

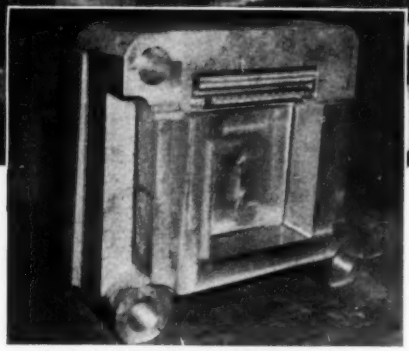


LANDIS TOOL COMPANY / WAYNESBORO, PENNA. / U.S.A.

55% less time

TO MACHINE THIS CAST ALLOY





Here's the finished holster. The entire part (all sides) were machined in 2 setups — including all milling, boring and drilling.

55% less machining time is only part of this job story. The rest is just as interesting to shop production men. Other time and labor saving G&L Horizontal Boring, Drilling and Milling machine benefits on this job are — less work handling (job formerly done on two different machines) — no layout needed (operator machined a locating surface and did the job from the blueprint). Tolerances were easily held.

This job is typical of how G&L Horizontal Boring,

GIDDINGS & LEWIS

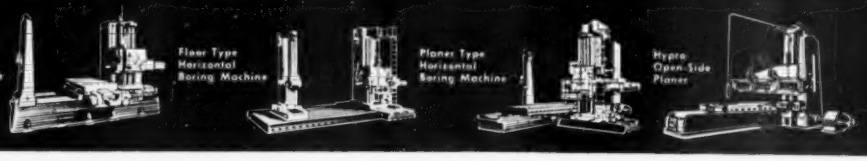
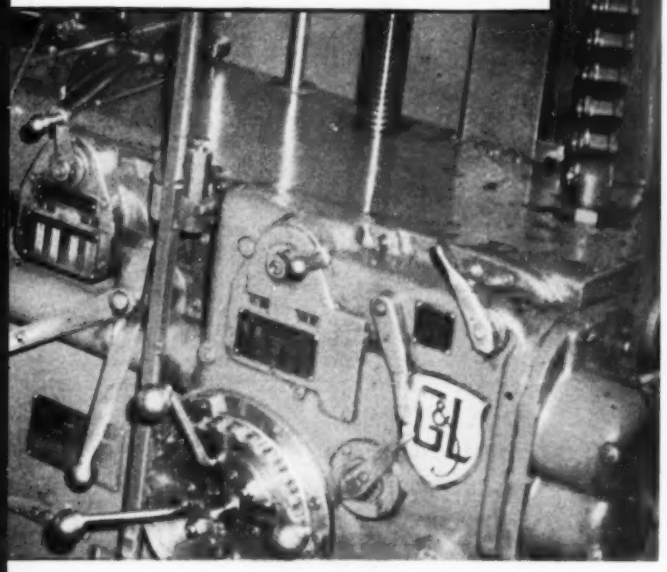


Table Type Horizontal Boring Machine
Floor Type Horizontal Boring Machine
Planer Type Horizontal Boring Machine
Hydro Open-Side Planer

needed

STEEL DIE BOLSTER



Drilling and Milling Machines can save you time and work handling... free equipment and operators for other jobs. G&L Horizontals' open-type construction means they can take large and small work, simple or complex. Extra-large working ranges mean there's a G&L multi-purpose Horizontal Boring, Drilling and Milling machine to meet your particular shop needs. It will pay you to get more information . . . and complete facts about G&L's Job Analysis Service. There's no obligation. See our nearest representative or write direct. Don't hesitate . . . DELIVERY MAY BE BETTER THAN YOU THINK!

G&L 5-POINT JOB ANALYSIS

takes the guesswork out of machine tool buying . . works for you and with you to solve big or complex machining problems..increases production . . reduces machining costs

1 **COMPLETE STUDY OF YOUR JOB OR JOBS** — G&L Job Analysis Engineers, working with your engineers, analyze your requirements by: (1) number and size of parts to be produced, (2) number and kind of operations needed, (3) tolerances and finishes required.

2 **DETERMINE MOST EFFICIENT MACHINING METHOD** — Taking into consideration the individual machining requirements of the job, G&L Job Analysis Engineers choose the most efficient machining method. G&L engineers can give an unbiased opinion because G&L builds a complete line of sizes and types of planers, planer-millers, vertical boring and turning mills and horizontal boring, drilling and milling machines . . . plus a complete line of accessories and tooling for these machines.

3 **SELECT THE SIZE, KIND AND TYPE OF MACHINE**—The machining method now determined, G&L Job Analysis Engineers — using your production and work requirements — recommend the exact size, kind and type of machine that will do the job most efficiently.

4 **PLAN YOUR OPERATIONS** — After the selection of the most efficient machine to fit your needs, G&L Job Analysis Engineers plan a sequence of operations that will (1) minimize number of setups and setup time, (2) use modern cutting tools to best advantage, (3) take full advantage of the machine working ranges and capacities, (4) keep operator fatigue to a minimum.

5 **RECOMMEND (AND DESIGN IF NECESSARY) THE TOOLS TO USE** — If conditions warrant, G&L will recommend the standard machine accessories, arrangements and tools you can use to make your equipment more productive—more versatile in application. If special equipment is needed, it will be designed to agreed specifications and made a part of your order.

Write, wire or phone G&L or its nearest representative today. Get the facts on your needs — your problems. Get a G&L unbiased Job Analysis to help you. Don't hesitate — there's no obligation . . . AND DELIVERY MAY BE BETTER THAN YOU THINK!

How to get a G&L job analysis

Call your nearest G&L dealer or write us direct. Furnish our Job Analysis Engineers with blueprints, job data, and production requirements. Factory engineers will completely analyze your machining problems. There's no charge, no obligation. Don't hesitate — do it today.

MACHINE TOOL CO.

G&L HYPRO

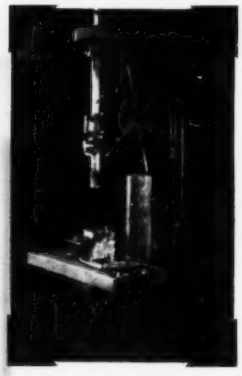
FOND DU LAC
WISCONSIN

STANDARD ENGINEER'S REPORT

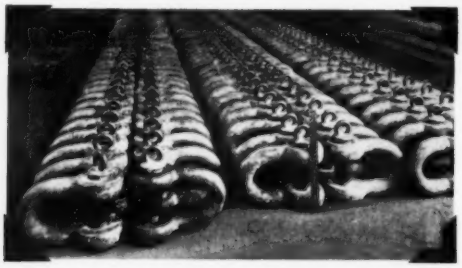
DATA

LUBRICANT	Calol TR Compound
TOOL	Heavy-duty tapping machine
LUBRICATOR	Brush and swab
SERVICE	Threading 4 inch nuts and shackles
FIRM	Schmitt Steel Co., Portland, Oregon

Special tapping compound increases production 43%!



TOOL LIFE INCREASED materially with the switch to Calol TR Compound. Note the excellent condition of this tap. It has threaded 1500 of the shackles and 1500 of the nuts—and is still good for many hours of service. This represents a considerable money saving as replacement cost of one of these large taps is nearly $500. Calol TR Compound also boosted work output. With the better lubrication, the machine could be operated at higher speeds and fewer shutdowns were necessary.

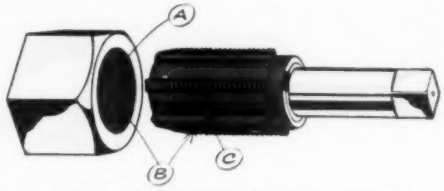


WHEN CALOL TR COMPOUND replaced the usual white-lead-mixture lubricant on 4" taps in the machine at left, defective work was completely eliminated.

Instead of 30 out of every 100 work pieces (big shackles and nuts above) being discarded because of torn or rough threads, all passed inspection.

REMARKS: Besides tapping and reaming, Calol TR Compound is recommended for deep drawing and forming, and difficult metal shaping where ordinary lubricants fail to prevent scuffing or galling. It has the consistency of No. 0 Grease and can be thinned with Calol Cutting Oils.

How CALOL TR Compound ups efficiency in severe metal-working conditions



A. Contains two unusually active extreme-pressure additives—prevents tearing, scuffing, galling of work, promotes good finish.

B. Withstands extreme temperatures—stops welding of tool and work, resists distortion, betters accuracy.

C. Provides good lubrication—allows faster machine speeds, increases production. Easily applied by brush or swab.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

CALOL

TRADEMARK "CALOL" REG. U.S. PAT. OFF.

STANDARD OIL COMPANY OF CALIFORNIA
225 Bush Street • San Francisco 20, California

THE CALIFORNIA COMPANY
P. O. Box 780 • Denver 1, Colorado

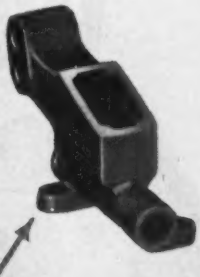
STANDARD OIL COMPANY OF TEXAS
P. O. Box 862 • El Paso, Texas

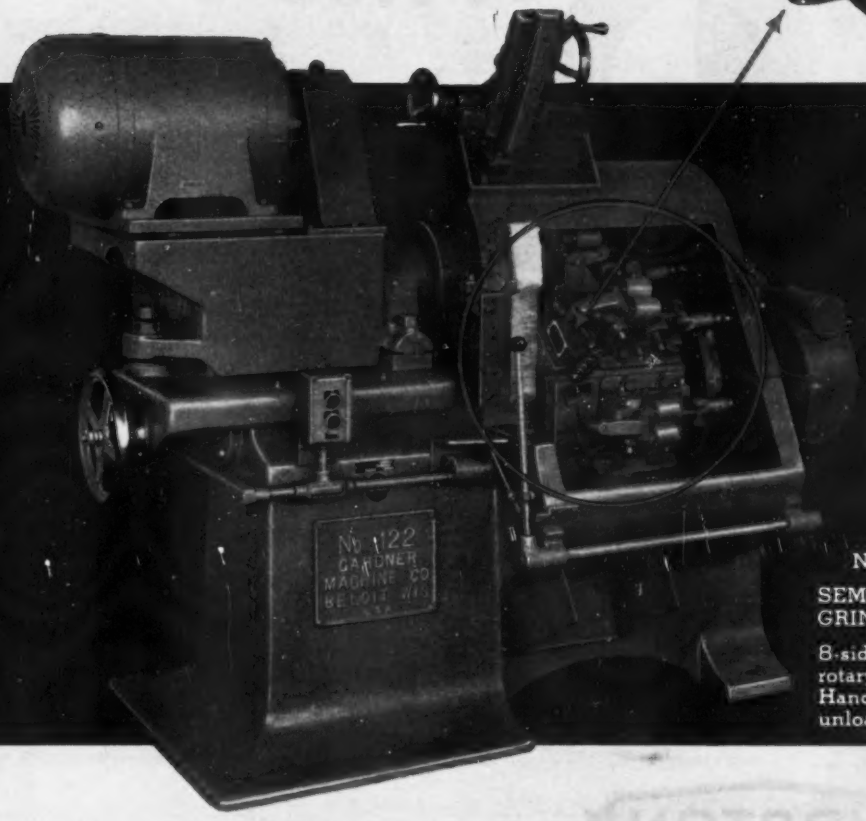
GARDNER

precision disc Grinders

12 Brake Cylinder Bodies Ground Per Minute

Cast iron cylinder bodies
Finished on one surface
Tolerances
.002" for flatness
.060" stock removal





NO. 122-20
SEMI-AUTOMATIC
GRINDER

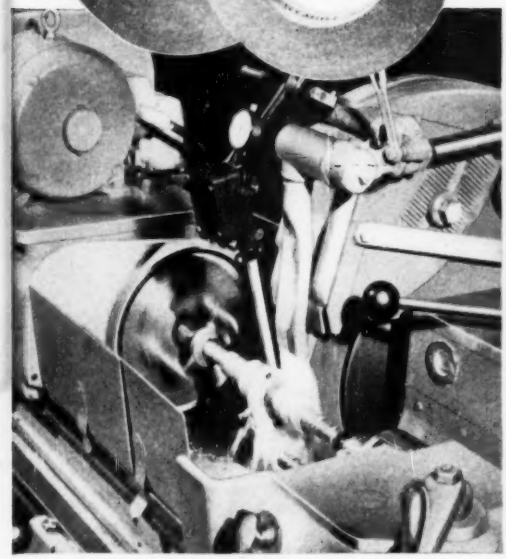
8-sided, driven, rotary work carrier. Hand-loading; gravity unloading.

10a M

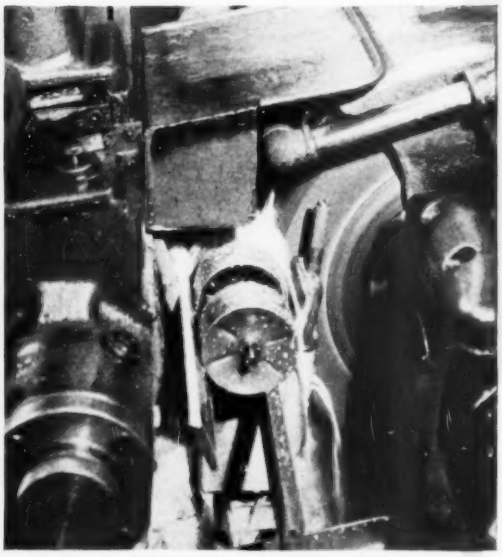
GARDNER MACHINE COMPANY
410 Gardner Street • Beloit, Wis.

Write for Catalog

Protect YOUR O. D. GRINDING INVESTMENT with Norton Wheels



Cylindrical grinding small shafts on a production basis.



Plunge-cut centerless grinding of textile machine pulleys.

NORTON
ABRASIVES

Making better products

Buying machines for O.D. grinding — cylindrical or centerless — is a sizable investment, to which you give a lot of serious thought. But remember:

No chain can be stronger than any of its links — and no grinding machine can be more efficient than its grinding wheels.

That's why it will pay you to weigh every condition carefully in your selection of the right grinding wheel. Because without the *right* wheel the costliest grinding equipment will not pay off for you as it should in more production at lowest possible cost.

Then consider this:

No matter what your O.D. grinding jobs are, Norton makes wheels that are exactly right for them. And your Norton Distributor is ready to tell you exactly which wheels you need.

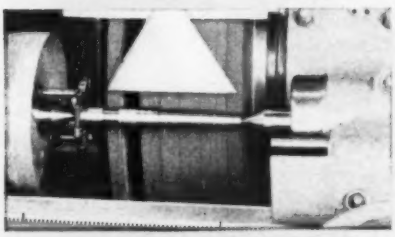
Norton Safeguards for Lower-Cost Grinding

Norton Abrasives, ALUNDUM* (fused alumina) and CRYSTOLON* (silicon carbide) are made in a variety of types and grain sizes for best results on every material handled in cylindrical or centerless grinding.

Norton Bonds, vitrified, resinoid, shellac and rubber are available for cool, free cutting action, extra long wheel life and just the finish you want.

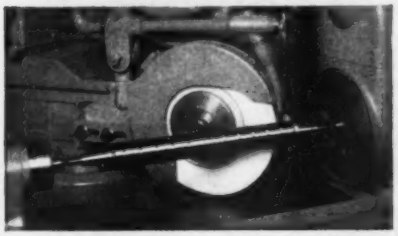
Norton Service includes the most comprehensive applicational aid in the field. In practically every case your Norton Distributor can quickly tell you the correct sizes and types of wheels to use. And if your problems are unusual, he can call on a Norton Abrasive Engineer to give you double assurance of the right wheel for every job.

These O. D. Grinding Machines Are Paying Off...WITH NORTON WHEELS



Wheels must be uniform in this cylindrical setup for grinding seven diameters at once.

Through-feed centerless grinding gives high production.



Cylindrical shoulder grinding, with wheel head swiveled to 45° angle.

Plunge-cut grinding to a shoulder in a centerless machine.

Test Your I.Q. on O.D. Grinding

How many of these questions on cylindrical and centerless grinding can you answer correctly?

- *What is the usual range of wheel speeds in these types of grinding?*
- *What conditions prevent wheels from cutting freely?*
- *What are the causes of chatter marks?*
- *When should a filter be used in the coolant system?*
- *What adjustments can you make if a wheel is acting soft? . . . if it is loading or glazing?*
- *What factors govern the choice of abrasives, grain sizes and bonds in wheels for O.D. grinding?*

You'll find answers to these and many other everyday questions on O.D. grinding applications — together with convenient selection charts for your general guidance — in this handy illustrated booklet. Ask your Norton Distributor for *The A.B.C. of O.D. Grinding*, or write direct for Form 2006. NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities.

to make other products better

*Trade-Marks Reg. U.S. Pat. Off. and Foreign Countries

facts tell the story { NEW CK USER BIG

KEARNEY & TRECKER MILWAUKEE

THE FACTS ON THIS JOB ARE:

Machine: New 25hp No. 5, Model CK Plain.
Material: Cast Steel, 150 Brinell.
Feed: 4¼ inches per minute.
Cutter Speed: 100 surface feet per minute.
Rate of metal removal: 17.5 cu. in. per min.
Production rate: 4 parts per hour.

NOTE: Each part requires but a *single pass* of the cutters on the new Kearney & Trecker CK machine. Old production rate: 1½ parts per hour—two passes required per piece.

MILLING MACHINE PAYS PRODUCTION DIVIDEND

NEW 25HP CK PLAIN MACHINE OUT PRODUCES PREVIOUS MACHINE NEARLY 4 TO 1!

CK MILLING MACHINE FEATURES THAT HELPED DO THIS JOB BETTER

Greater rigidity of new CK column easily absorbed vibration from heavy cutting load. Only single pass needed for each part.

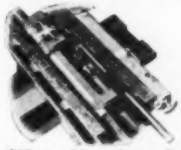
CK's positive, metered pressure and automatic lubrication assured cool, wear-free operation in spite of heavy cutting load.

No. 60 heavy-duty drive flange around spindle nose permitted use of an extra-rigid heavy-duty arbor on this multiple cutter setup.

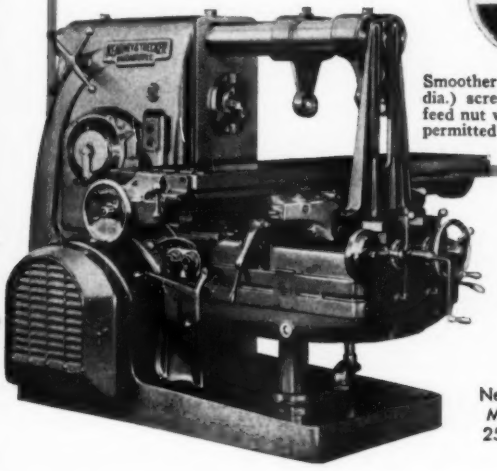
CK's 3-bearing spindle and flywheel assure Maximum Cutter Efficiency. On this job it meant fast metal removal and smooth finish in a single pass.

The new Kearney & Trecker CK milling machine doing this job has 24 different spindle speeds (13 to 1300 rpm.) Its 32 different table feeds range from ¾" to 90" per minute. Thus operator was able to *pick exact speed and feed* to get fullest advantage from high horsepower and modern cutting tools. This meant Greater Productivity on this job.

Smoother Feed of CK's large (2" dia.) screw and extra-long table feed nut with backlash eliminator permitted heavy cut.

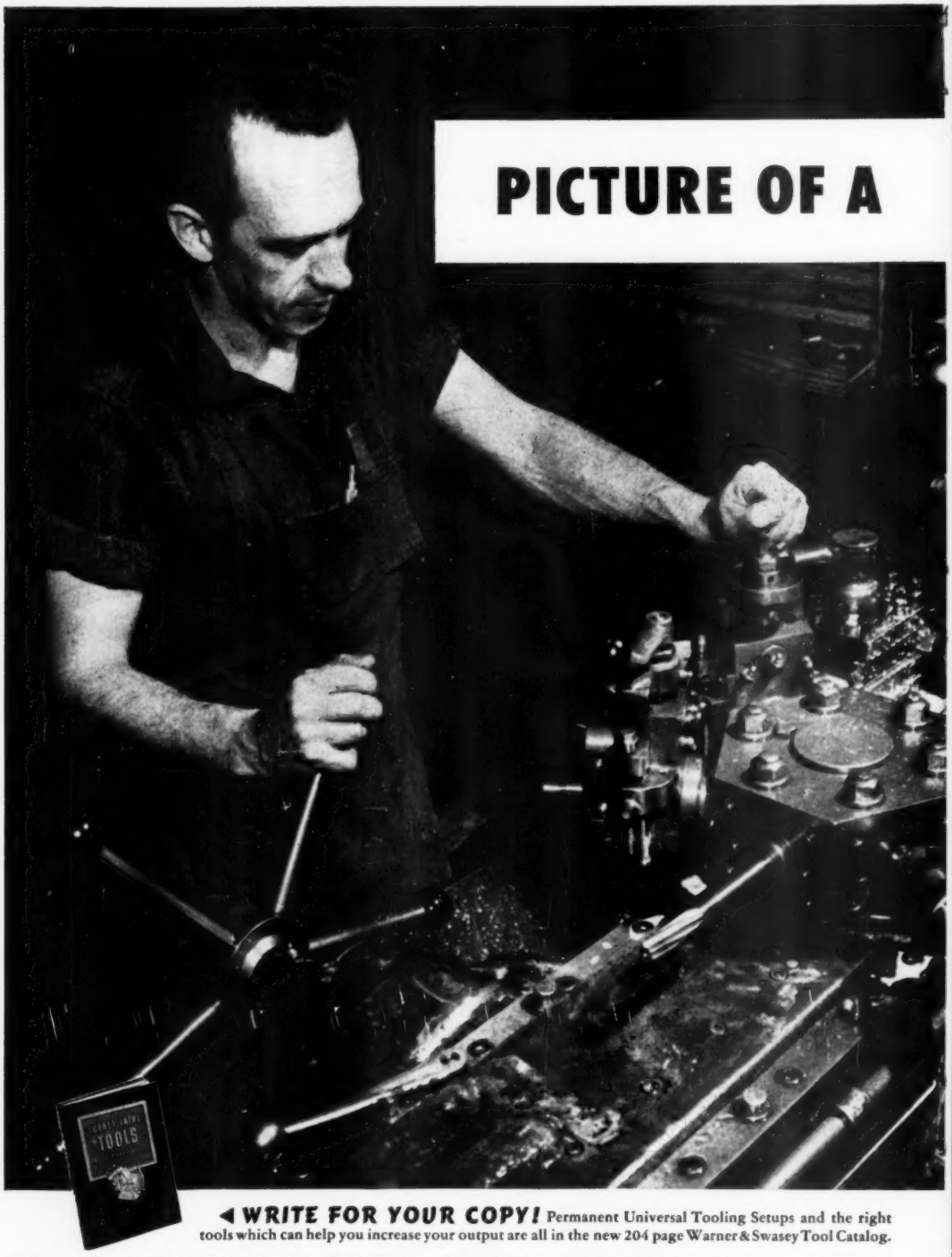


New CK machines have Greater Horsepower. On this job, 25hp enabled operator to get maximum production from his cutters.



New No. 4 Model CK 25hp Plain

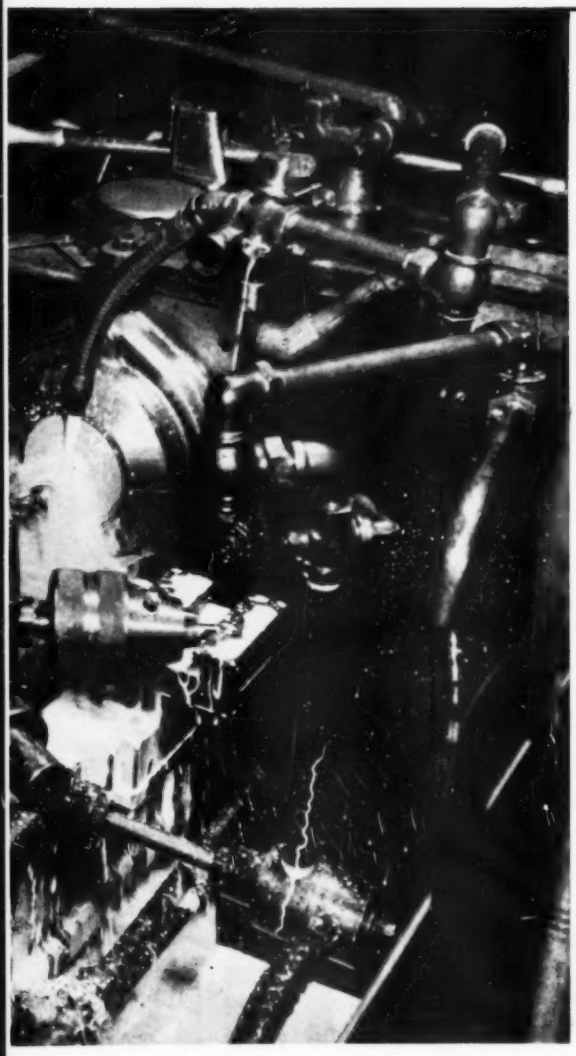
Investigate the new CK line of milling machines. You'll find every feature is test and job-proven to give you cost-cutting results . . . greater machine capacity, productivity and better finished products. Contact your nearest Kearney & Trecker representative or write: Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wisconsin.



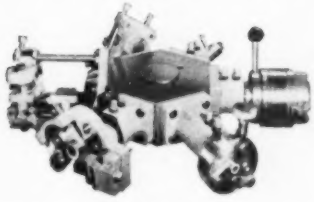
◀ **WRITE FOR YOUR COPY!** Permanent Universal Tooling Setups and the right tools which can help you increase your output are all in the new 204 page Warner & Swasey Tool Catalog.

YOU CAN MACHINE IT BETTER, FASTER, FOR LESS WITH WARNER

MAN PRODUCING 25% MORE



same job, same operation but *Better Tools!*

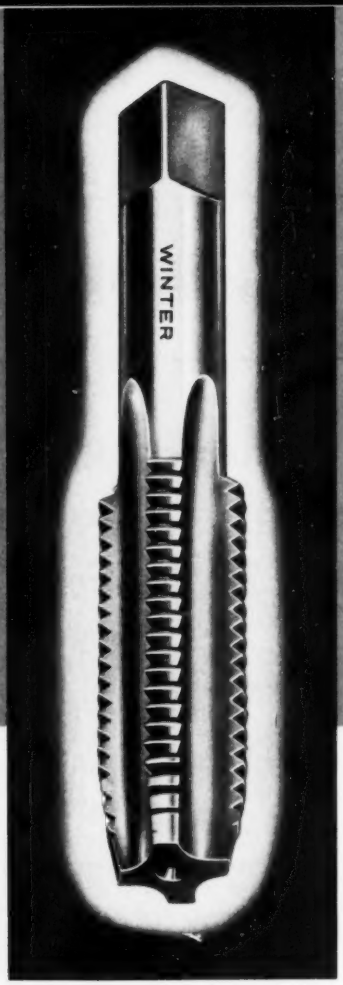


Electrol Incorporated, of Kingston, New York, transferred this precision Stop-Plunger job to a Warner & Swasey No. 3 Universal Turret Lathe because it had the speed and accuracy required, as well as the proper tooling for the job. The result was a 25% increase in production of this high pressure hydraulic control part.

This shop has found it can do more jobs faster on Warner & Swasey Turret Lathes with the Standard Tooling Setups that fit their requirements. Multiple and combined cuts, with shorter setup time, mean profitable production increases.

WARNER & SWASEY
Cleveland

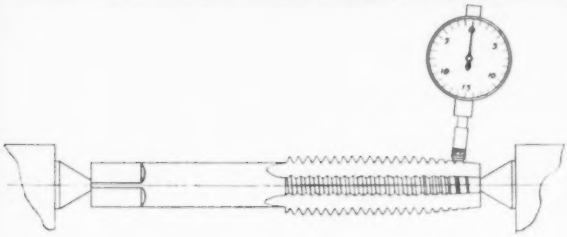
& SWASEY TURRET LATHES, AUTOMATICS AND TAPPING MACHINES



QUALITIES OF CRAFTSMANSHIP IN WINTER HAND TAPS

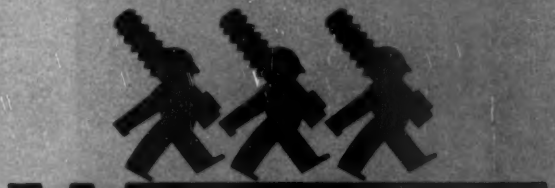
Accurate and Concentric Chamfers

For the production of uniformly accurate tapped holes all cutting edges must be truly concentric with the axis of the tap. They must also be of the same shape and of equal spacing. Accurate and concentric chamfers, along with exact flute spacing and uniform flute contours, are qualities inherent in Winter *Balanced Action* Taps. The complete Winter line includes hand, nut, chip driver, machine screw, pipe, pulley, and tapper taps, stocked conveniently at Winter branches in New York, Detroit, Chicago, and San Francisco.



ALWAYS AT YOUR SERVICE

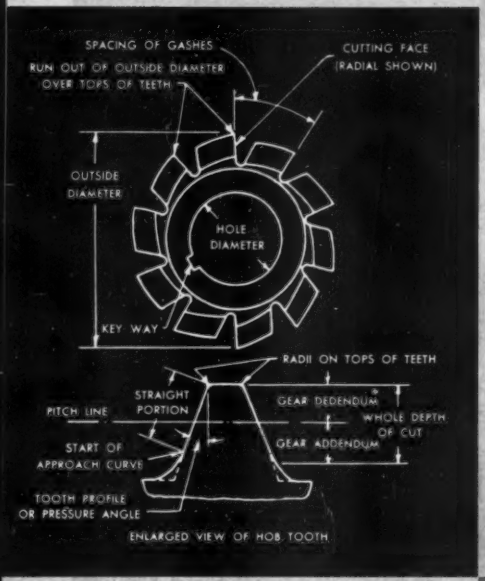
YOUR LOCAL DISTRIBUTOR carries a complete stock of WINTER Taps on his shelves—as close to your tapping problems as the telephone on your desk.



WINTER

WINTER BROTHERS COMPANY • Division of the National Twist Drill and Tool Company, Rochester, Michigan, U. S. A. • Distributors in Principal Cities • Branches in New York, Detroit, Chicago, San Francisco

POINTS OF SUPERIORITY IN NATIONAL HOBS

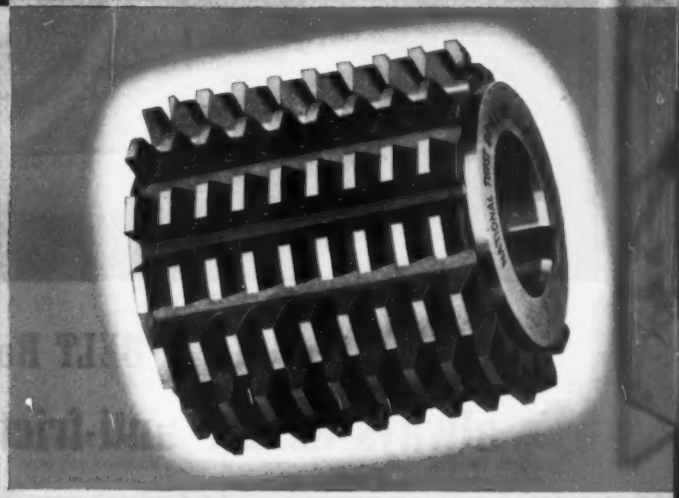


Manufacturing Control

Every step in the production of National Hobs, from hammer forging to final inspection, is subject to close manufacturing control. Blanks must pass both chemical and metallurgical laboratory tests before release to the manufacturing departments. Tooth size and shape must be absolutely uniform; hardening and tempering operations are carefully regulated to effect the best cutting qualities. Inspection, by means of specially designed gauges, maintains accuracies of finished hobs within close tolerances. National manufactures a complete line of cutting tools including twist drills, reamers, milling cutters, hobs, counterbores, and special tools.

CALL YOUR DISTRIBUTOR

LEADING DISTRIBUTORS EVERYWHERE offer complete stocks of NATIONAL metal cutting tools. Call them for cutting tools or any other staple industrial products.



NATIONAL TWIST DRILL & TOOL CO. ROCHESTER, MICH., U.S.A.

National

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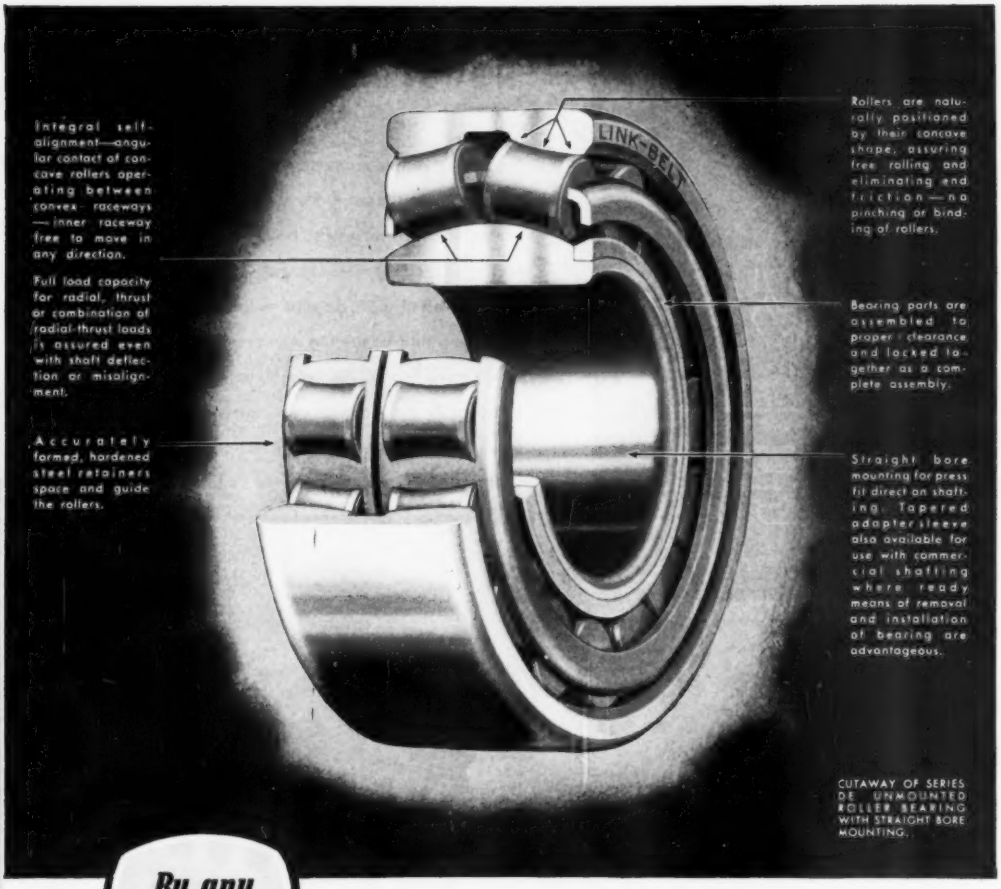
LINK-BELT Ball and Roller Bearings smooth the path of power


Integral self-alignment—angular contact of concave rollers operating between convex raceways—inner raceway free to move in any direction.
Full load capacity for radial, thrust or combination of radial-thrust loads is assured even with shaft deflection or misalignment.
Accurately formed, hardened steel retainers space and guide the rollers.
Rollers are naturally positioned by their concave shape, assuring free rolling and eliminating end friction—no pinching or binding of rollers.
Bearing parts are assembled to proper clearance and locked together as a complete assembly.
Straight bore mounting for press fit direct on shafting. Tapered adapter sleeve also available for use with commercial shafting where ready means of removal and installation of bearing are advantageous.
LINK-BELT

CUTAWAY OF SERIES DE UNMOUNTED ROLLER BEARING WITH STRAIGHT BORE MOUNTING.

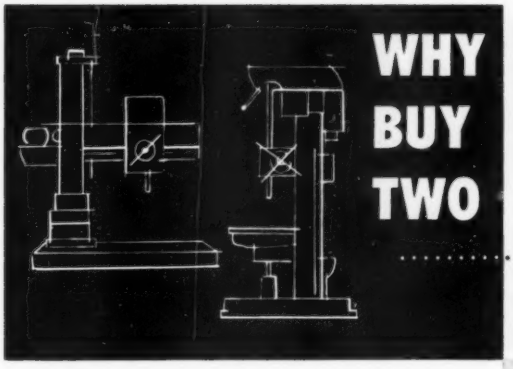
By any standard . . . **LINK-BELT Roller Bearings always assure anti-friction alignment**

Integral self-alignment of Link-Belt Unmounted Roller Bearings eliminates need for expensive, cumbersome self-aligning housings. Angular contact, concave rollers between convex raceways, provides capacity for thrust and radial loading. Preadjusted for clearance at the factory and packed to reach you in "final inspection" condition, they require no adjustment when you're ready for installation. There's a Link-Belt Bearing Specialist near you who can give you expert advice on *any* bearing application. You can also get all the facts from Data Book 2550.

LINK-BELT

Ball and Roller Bearings

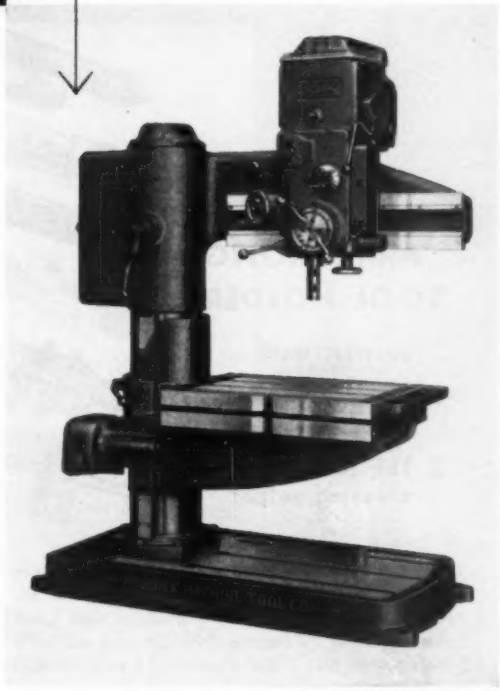
LINK-BELT COMPANY: Indianapolis 6, Chicago 9, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices, Factory Branch Stores and Distributors in Principal cities. 12.288



WHY BUY TWO ..... WHEN one WILL DO?

Fosdick's Sensitive Radial combines Upright and Sensitive features—rigidity, compactness and convenient table height—with the capacity and flexibility of a Radial. Fosdick has made the table unusually adjustable, leaving the arm at a fixed height. The unique, one-piece column construction makes possible unusual rigidity. Arm clamping is simplified. You get *all* the advantages of *both* the old reliable drills, at roughly the cost of one!

Workpiece sizes accommodated by the Sensitive Radial include the ranges of both Uprights and Radials; setting up on either the adjustable table or the base of the machine. Controls remain clustered at a constant, convenient operator's height.



YOUR TOOL DOLLAR buys more capacity in less shop space when you put Fosdick's compact versatility to work on your drilling problems. Only Fosdick builds the Sensitive Radial. Call your distributor or write for Bulletin SRA.

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

RADIAL DRILLS
SENSITIVE AND UPRIGHT DRILLS
JIG BORERS
AUTOMATIC POSITIONING MACHINES
SENSITIVE RADIAL DRILLS

FOSDICK

ARMSTRONG

ARMSTRONG TOOL HOLDERS

answer both . . .

1. **The problem of lowering costs**
2. **The problem of increasing output**

By providing permanent, multi-purpose, inexpensive ARMSTRONG TOOL HOLDERS that use cutters or bits that are quickly ground from standard high speed shapes (Saving: All Forging, 70% Grinding and 90% High Speed Steel), the Armstrong System of Tool Holders will reduce your tool cost to an absolute minimum.

By providing stronger, more efficient tools, carefully developed for each operation, as well as ARMSTRONG High Speed Steel, ARMALOY Cast Alloy Cutter Bits or Armide Carbide-Tipped Cutters as required for each job, ARMSTRONG TOOL HOLDERS permit greatly increased speeds and feeds, enable you to increase the hourly output of every lathe, planer, slotter, shaper, turret lathe and screw machine.

There is no surer way to lower costs and increase output, than to use the correct ARMSTRONG TOOL HOLDER for each operation on all machines.

Stocked by Leading Tool Departments

ARMSTRONG BROS. TOOL CO.

"THE TOOL HOLDER PEOPLE"

5215 W. Armstrong Ave. Chicago 30, U.S.A.

New York and San Francisco

Write for Catalog.

92 hrs. of heat treatment

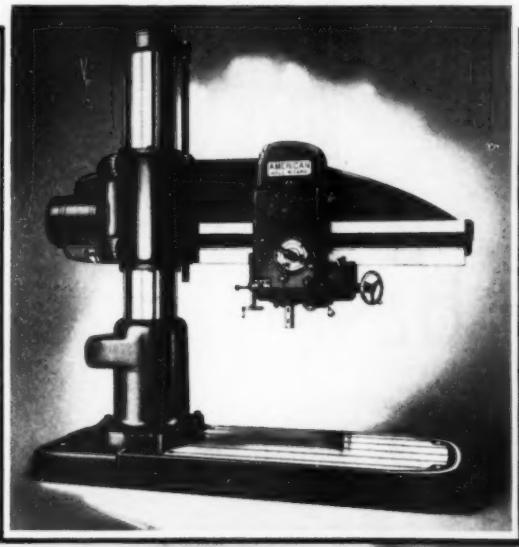
. . . required to produce the ultimate in radial drill spindles

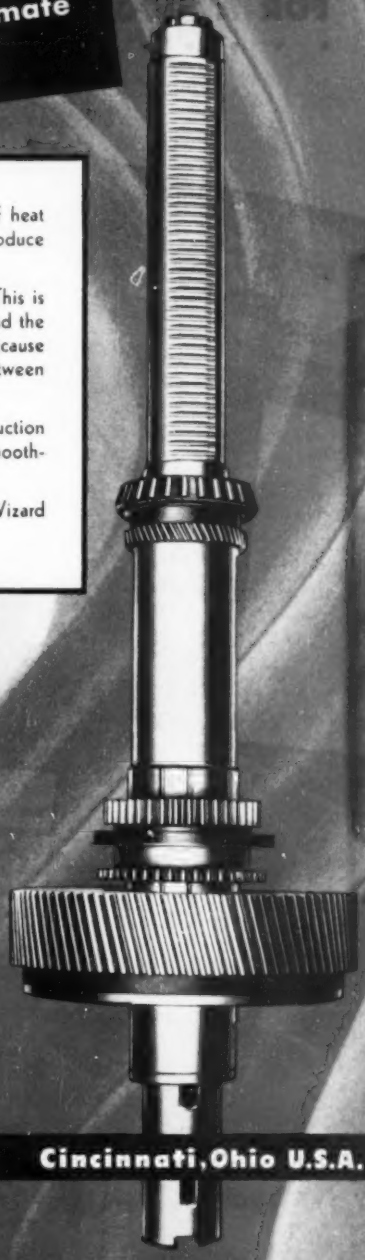
"AMERICAN" Radial Drill Spindles are made of nitralloy. 20 hours of heat treatment from rough to finish, then 72 hours of nitriding are required to produce the wear-resistant spindles used in these radials.

Both the spindles and sleeves are nitrided to 110 degrees scleroscope. This is harder than some grades of cemented carbide. The sleeve is finish honed and the spindle ground and then diamond lapped to a sliding fit in the sleeve. Because of the lack of affinity between these two hard surfaces the clearance between them may be reduced to the very minimum, which in this case is .00025".

This results in the greatest possible stability, resulting in an ideal construction especially for accurate boring operations, which demand a high degree of smoothness and rigidity of the spindle.

This is but one of the super features that make the "AMERICAN" Hole Wizard an outstanding investment.



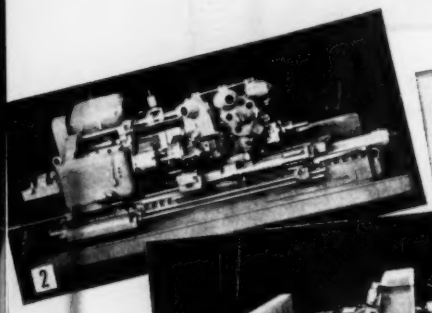


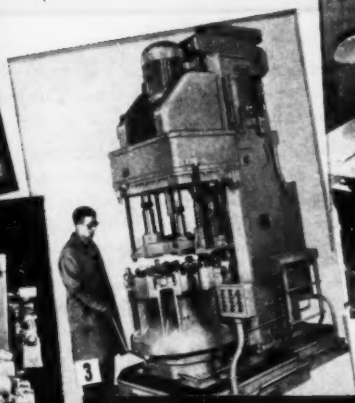
THE AMERICAN TOOL WORKS CO. **Cincinnati, Ohio U.S.A.**

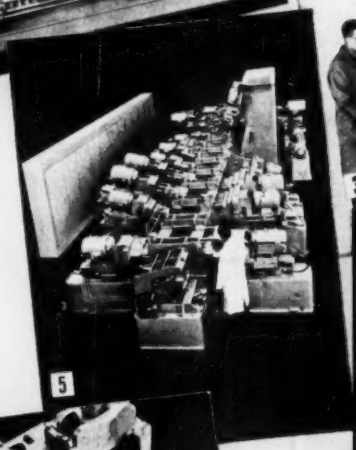
Lathes and Radial Drills

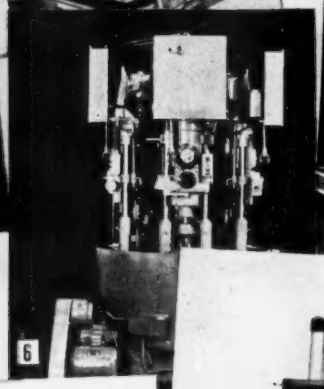
Backbone

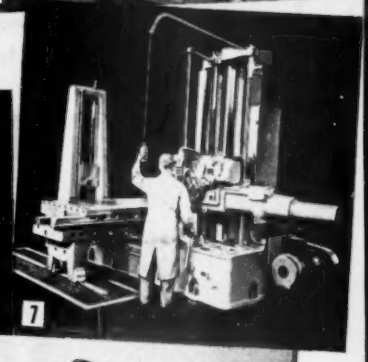
FOR A $100 BILLION-A-YEAR JOB

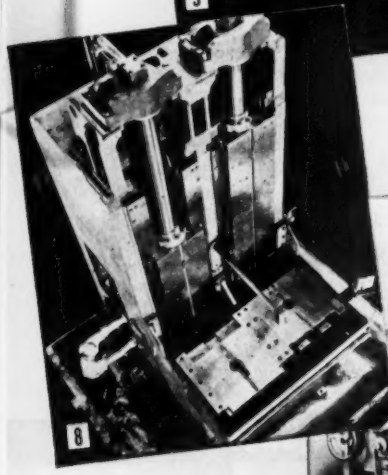


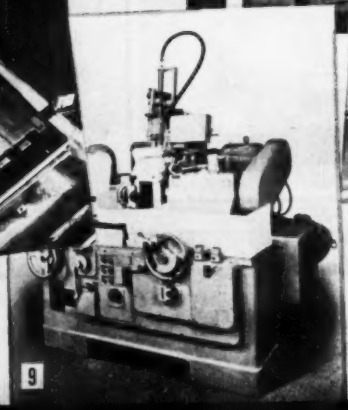


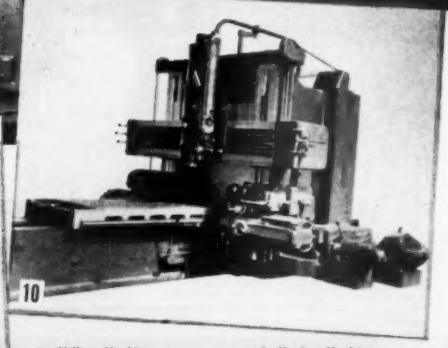












1. Milling Machine
2. Automatic Lathe
3. Multiple-Spindle Drilling Machine
4. Boring Machine
5. Transfer Machine
6. Honing Machine
7. Horizontal Boring, Drilling & Milling Machine
8. Broaching Machine
9. Grinding Machine
10. Planer

These are a few of the machines which help to make Metalworking the most productive of all industries.

They are also some of the tremendously important types of machinery for which *American Machinist* carries more advertising than any other magazine in the world.

They are expensive machines...and the men who say "Yes" to their purchase must have <u>real buying authority.</u>

***American Machinist*'s ability to deliver the biggest, all-paid subscription audience of any metalworking magazine... and an audience highly concentrated among management men with the authority to say "Yes" to important purchases*... is the reason advertisers to Metalworking invest the most dollars in *American Machinist* year after year.**

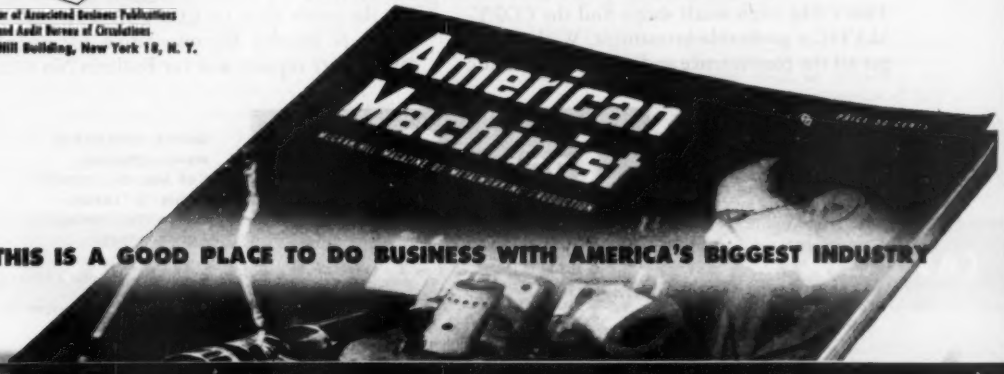
It is also a good reason why <u>you</u> can sell more, in big quantities, at less cost, when you concentrate <u>your</u> advertising in.....

American Machinist

THE McGRAW-HILL MAGAZINE OF METALWORKING-PRODUCTION

Member of Associated Business Publications and Audit Bureau of Circulations
McGraw-Hill Building, New York 18, N. Y.

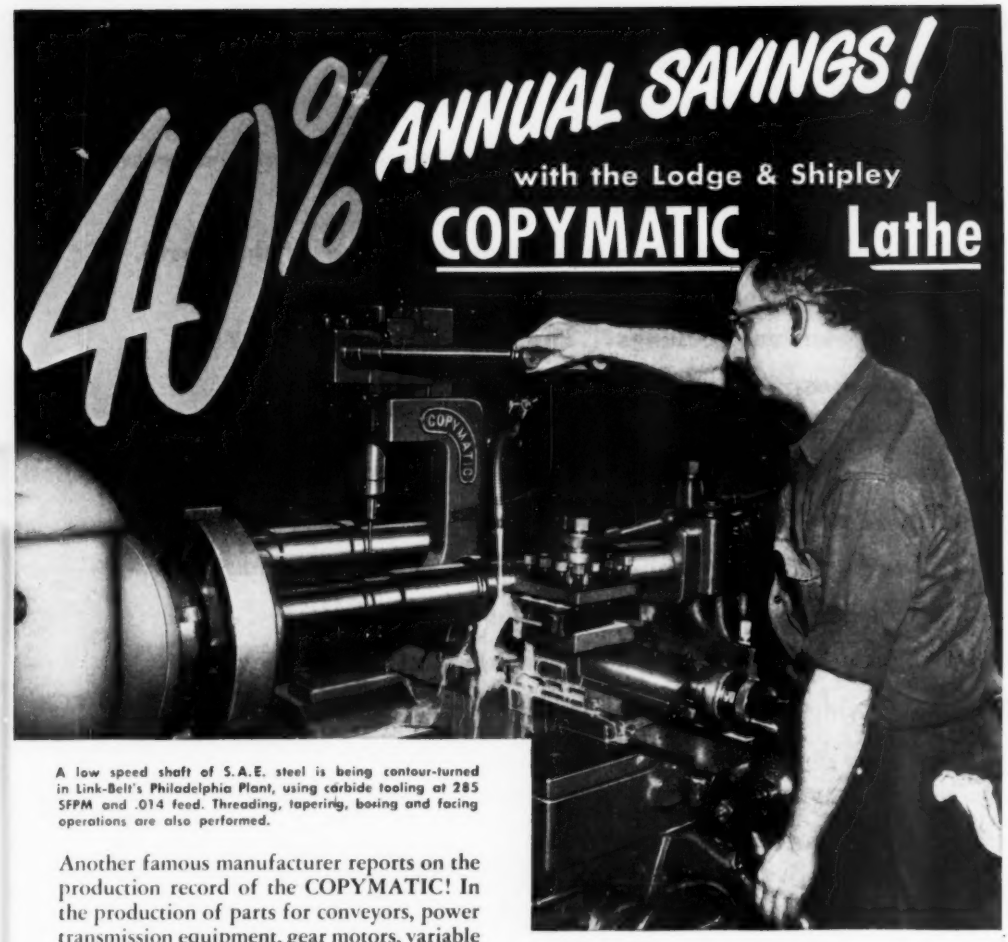
***American Machinist offers you 9,869 more *management subscribers* than any other metalworking publication (ABC 6/51: subscriptions to corporate officials, department managers, superintendents, and engineers). And for PROOF of the high buying power of the *American Machinist* audience, ask for your copy of the Advertising Research Foundation's Study of the Audience and Readership of *American Machinist*.**



THIS IS A GOOD PLACE TO DO BUSINESS WITH AMERICA'S BIGGEST INDUSTRY

40% ANNUAL SAVINGS!

with the Lodge & Shipley COPYMATIC Lathe



A low speed shaft of S.A.E. steel is being contour-turned in Link-Belt's Philadelphia Plant, using carbide tooling at 285 SFPM and .014 feed. Threading, tapering, boring and facing operations are also performed.

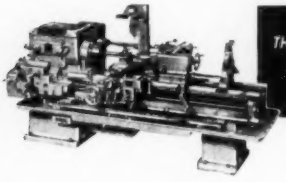
Another famous manufacturer reports on the production record of the COPYMATIC! In the production of parts for conveyors, power transmission equipment, gear motors, variable speed drives, "Electrofluid" drives and similar units, the Philadelphia Plant of Link-Belt Company reports "40% annual savings"; up to "50% time saved over former methods," with the COPYMATIC Lathe.

Even on limited production runs, COPYMATIC users report savings of as much as 300% compared to former lathes.

That's why even small shops find the COPYMATIC a profitable investment. With it, you get all the convenience and speed of hydraulic duplication plus the outstanding versatility of the Lodge & Shipley "Model X" Lathe.

Changeover from standard operation to automatic duplication is instantaneous. Often, the first piece of a run is produced by standard operation and is then inserted in the template supports and used to produce the rest of the lot automatically.

Get the profit facts on COPYMATIC. Ask a Lodge & Shipley Representative for actual case history reports and for Bulletin No. 675.

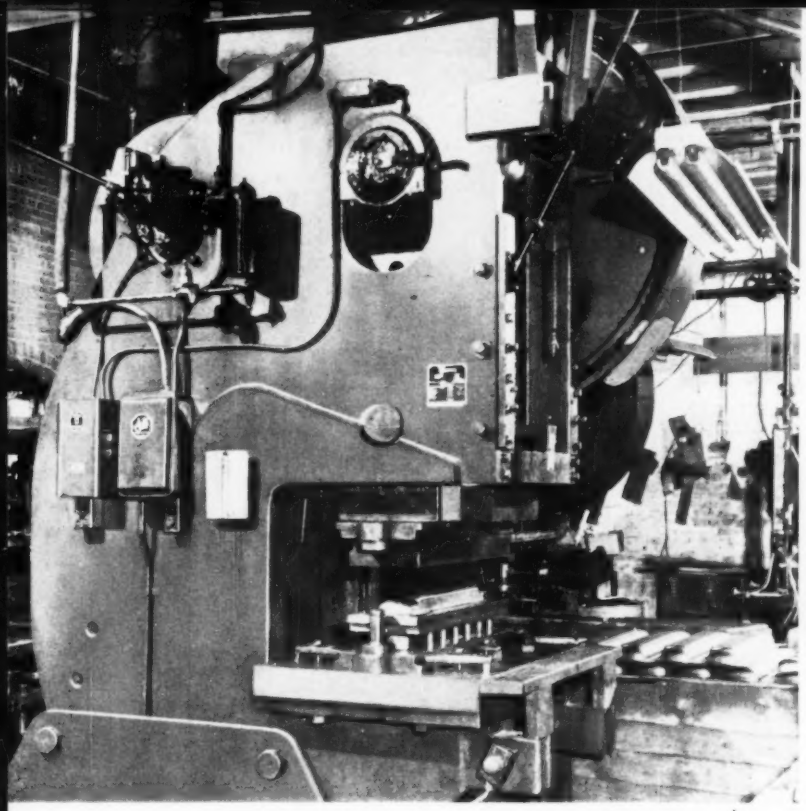


THE Lodge & Shipley COMPANY

MACHINE TOOL DIVISION • 3059 COLERAIN
CHOREMASTER DIVISION • 800 EVANS ST
CINCINNATI 25, OHIO

ENGINE, TOOLMAKER, MANUFACTURING, GAP AND OIL COUNTRY MODEL "X" LATHES; COPYMATIC, DUOMATIC AND T-LATHES*

*Trade Mark, The Lodge & Shipley Co.



What's YOUR problem?

Wesley L. Tharp, with headquarters in Indianapolis, is the Standard Oil lubrication specialist who recommended STANOSTAMP Compound "C" to this midwest lamp manufacturing company.

Specially trained and experienced Standard Oil lubrication specialists are located in strategic spots throughout the Midwest. There's one near your plant, ready to give you the benefit of his experience.

You can obtain his prompt, on-the-spot service by phoning or writing to your local Standard Oil office. And when the specialist calls on you, ask him about these other fine Standard Oil products.

STANICUT Cutting Oils. These special-duty cutting oils meet today's most exacting requirements and highest production schedules. Grades vary in viscosity and compounding. Each contains the correct proportion of extreme-pressure and friction-reducing ingredients.

STANICOOL HD Soluble Oil. Because of additional compounding, this heavy-duty soluble oil possesses the cooling ability of an emulsion and also gives better tool life and finer finishes than do conventional soluble oils.

STANOLEX Oils. Due to superior wetting ability, these oils are useful on bearings which are inclined to rust during shutdown, or because of high humidity. They are recommended for lubrication of ways and guides on machine tools which are prone to chatter when straight mineral oils are used.

Beats trouble to the draw...

Drawing lamp shades from 20 gauge, cold-rolled steel proved troublesome for the General Lamps Manufacturing Corporation of Elwood, Indiana. Rejections averaged 15%. In addition to this costly scrapping, finish was not satisfactory. It was difficult to remove the die lubricant from the completed shades. Dies had to be polished frequently.

Operators sought a die lubricant which could remedy their production slow-up. Of a number of products tried, STANOSTAMP Compound "C"—the recommendation of a Standard Oil lubrication specialist—gave the best results.

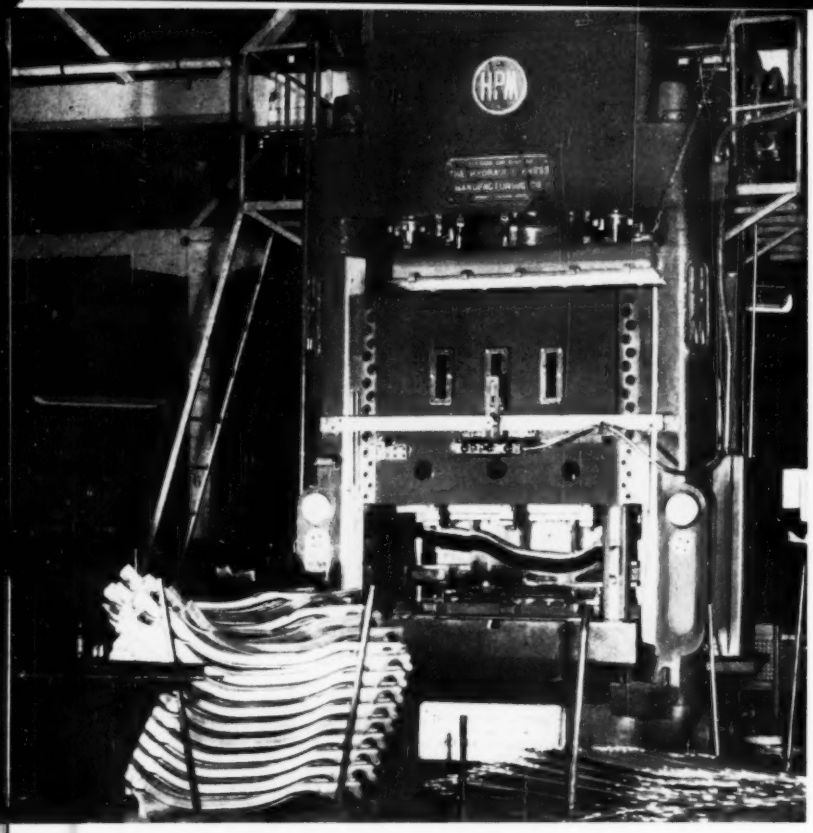
Use of STANOSTAMP "C" has cut rejections from 15% to less than ½%. Excellent finish has been obtained on the shades. Cleaning of dies has taken minimum time and labor. As a result, STANOSTAMP has helped boost production by more than 15%.

Stanostamp
REG. U.S. PAT. OFF.
Compounds

Discuss the advantages of STANOSTAMP Compounds and Standard Oil cutting oils with a Standard Oil lubrication specialist. His headquarters are near your plant. How you can benefit from his services is explained at the right.

Standard Oil Company (Indiana), 910 South Michigan Ave., Chicago 80, Illinois.

STANDARD **STANDARD OIL COMPANY (INDIANA)**



What's YOUR problem?

D. G. Cripps, of Standard Oil's Grand Rapids, Michigan, office, is the Standard Oil lubrication specialist who recommended STANOIL for use in the hydraulic press shown at the left.

Complete familiarity with job requirements and lubrication applications equips a corps of such Standard Oil lubrication specialists throughout the Midwest to handle similar problems for plant operators.

One of these lubrication specialists is near your plant – ready to give you the benefit of his experience and training. You can obtain his services quickly and easily. Just phone or drop a card to the nearest Standard Oil Company (Indiana) office. Ask the lubrication specialist to explain the benefits of such widely accepted lubricants as:

SUPERLA Greases—Available in all consistency grades, SUPERLA Greases cover a wide range of applications. These products are comparable in quality to the highest type of special greases but are as readily available and economical as ordinary cup greases.

CALUMET Viscous Lubricants—On open gears and wire rope, these greases strongly resist washing and throw-off. Their superior wetting ability affords better coating of gears and chains, better internal lubrication of wire rope.

STANORUST Rust Preventives—The eight grades of STANORUST form one of the most complete and effective lines of rust preventives on the market today. Each has been scientifically and specifically developed for its intended use. The grades range from a finger print remover to a heavy petrolatum that protects against corrosion for years under the most severe outdoor exposure.

Gain these benefits for your hydraulic operations

The big 400-ton hydraulic press shown above is used to stamp out parts for farm machinery in a big midwest plant.

When the press was first put into operation, plant operators followed the recommendation of a Standard Oil lubrication specialist and used STANOIL Industrial Oil in the hydraulic system. In over four years of continuous hard service, there has been no lost time because of inefficient performance of the hydraulic oil.

Oil capacity of the system is approximately 9 barrels; only 2 barrels make-up per year has been required. The oil in this system has never been changed. It has been centrifuged once to remove moisture which accumulated over three years' operation. Periodic tests of oil samples have shown that STANOIL has maintained its high lubricating quality. A recent analysis showed no increase in viscosity of the oil, no change in color, and a neutralization number of only 0.13 mg. KOH/gm.

You can rely on this unique many-purpose

STANOIL
TRADE MARK
Industrial Oil

oil to give you the same clean, dependable service in your plant's hydraulic systems, speed reducers, head stock gears, auxiliary turbines, compressors, and electric motors. You can rely, too, on the expert, on-the-spot service of a Standard Oil lubrication specialist. How you can obtain his help, quickly and easily, is explained at the right.

Standard Oil Company, 910 So. Michigan, Chicago 80, Illinois.

STANDARD OIL COMPANY (INDIANA)

STANDARD

"ALL OUR MONEY BACK IN 62 DAYS"

writes KRW Hydraulic Press customer, George Perkins

ANY METAL
ANY TIME
ANY WHERE

MANUFACTURER OF
PERKINS SAFETY SADDLE TANK

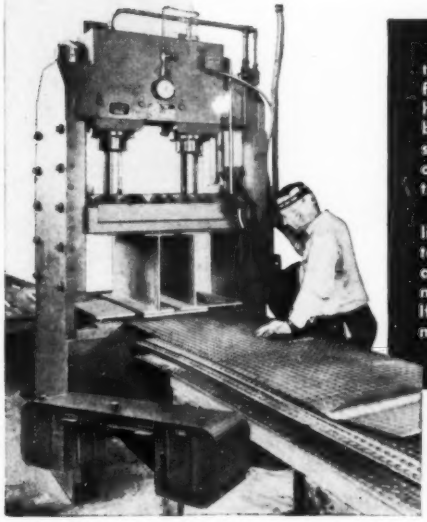
GEORGE PERKINS
Electric and Acetylene Welding
1292 FUHRMANN BOULEVARD

K. R. Wilson,
215 Main St.
Buffalo 3, N. Y.

Gentlemen:

I'm not usually a testimonial writer, but I can't help letting you know what a terrific job my new KRW 100 ton, 2 cylinder hydraulic press has done in my shop. My cost records actually show that this press **paid for itself in just 62 days.** And, believe it or not, I sold almost 9,000 tanks in 1950 without a single return or complaint.

Sincerely yours,
George Perkins
Perkins Welding Co., Buffalo, N. Y.



Mr. Perkins makes steel saddle tanks for big trailer trucks. They hold 125 gallons of gas, obviating the need for frequent stops to fill up. KRW engineers showed Mr. Perkins how to save time and cut production costs by forming and bending these tanks with a KRW hydraulic press. They also showed him how to form stiffening ribs on the tanks instead of the welded angle stiffeners he was using. Results? The tanks are now 60% stronger.

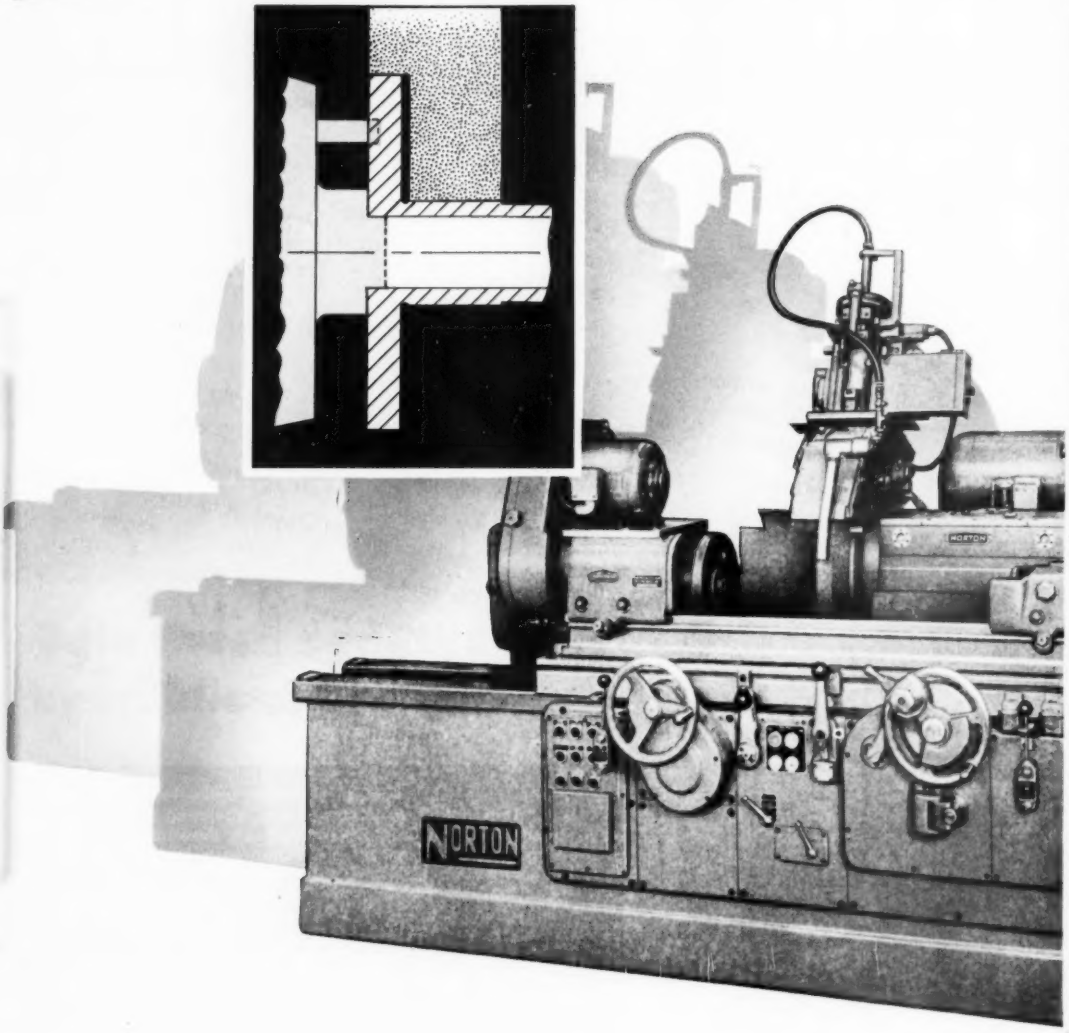
KRW Hydraulic Presses can do the same for you on literally hundreds of manufacturing jobs. Available in 25-150 ton capacities, they're entirely above ground. Hand operated, air operated or motor driven. One, two and three cylinder models. First investment is low, operating costs still lower. If you need a specially-built press, our engineering department will "tailor-make" one to your needs.

Ask your machinery dealer to quote you, or write Dept. 11

K·R·WILSON

215 MAIN STREET • BUFFALO 3, N.Y.

One NORTON TYPE CTU GRINDER •



Making better products to make other products better

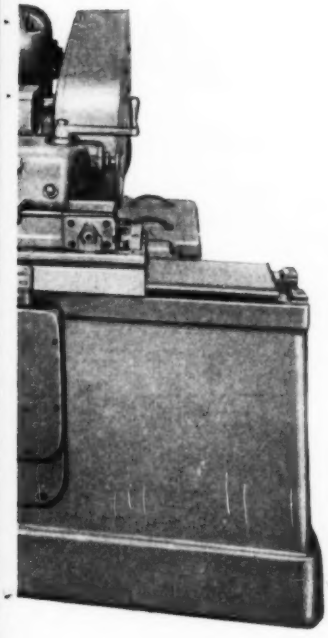
NORTON COMPANY, WORCESTER 6, MASS., U. S. A.

DISTRICT SALES OFFICES: HARTFORD • NEW YORK • CLEVELAND • CHICAGO • DETROIT

. . Replaces 2 Machines
Doubles Production
Saves Time and Labor

PROBLEM

In producing a transmission part, a prominent automotive concern was grinding two diameters on the part in separate operations. By this procedure, only 300 complete pieces were being obtained in 8 hours.



ACTION

To combine these operations, a Norton 10" Type CTU Semiautomatic Grinder was purchased. This machine was equipped with an Electric-Eye Work Positioning Arrangement to speed loading, and an Automatic Wheel Guard Type Truing Device for rapid truing of the single grinding wheel to both required diameters.

RESULT

A 100% increase in output was obtained. The fast action of the new machine plus the speed of automatic truing, and the reduced time for handling doubled output for this manufacturer to 600 complete pieces in 8 hours.

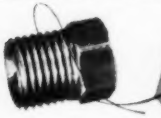
To Economize
Modernize
with NEW
NORTON
GRINDERS and LAPPERS
M60S

Faster production like this when you

Production Increased 29%

Hourly Output Increased 49%
Tool Life Increased 25%

Production Increased 41.7%



Production Increased 33⅓%

Production Increased 66%
Tool Life Increased 87%

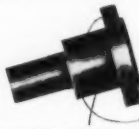
Production Increased 42.5%
Tool Life Increased 100%

Production Increased 35%

Production Increased 50%

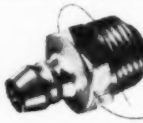
Production Increased 29%
Tool Life Increased 20%

Daily Output Increased 19%
Tool Life Increased 39%

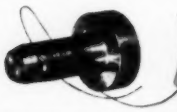


Tool Life Increased 200%

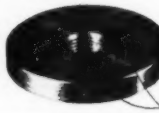
Production Increased 51%



Production Increased 17%
Tool Life Increased 50%



Production Increased 26%
Tool Life Increased Almost 100%



Production Increased 27%

Production Increased 55%
Tool Life Increased 30%

saves man-power...

do the job with MX

today's freer-cutting screw stock!

IN SHOPS where manufacturers of screw machine parts have switched from ordinary Bessemer screw stock to U·S·S Free-Machining MX, output per man, per machine, per hour has increased. The obvious results? Shop efficiency has jumped . . . unit costs have dropped.

The greater machinability of MX permits higher cutting speeds and longer periods between tool grinds. This is especially important today as the man-power pinch becomes increasingly acute.

Your man-shortage troubles are bound to become less pressing when you can increase your output 27%, 50%, or 66%; when your tools last two or three times as long—as on some of the typical MX-produced parts shown here.

Helpful, too, under present conditions is the fact that MX, because of its greater uniformity and better machinability, will permit you to turn out, *rapidly* and to close tolerances, the intricate and precise screw machine products now being called for.

And MX will cut their cost as well.

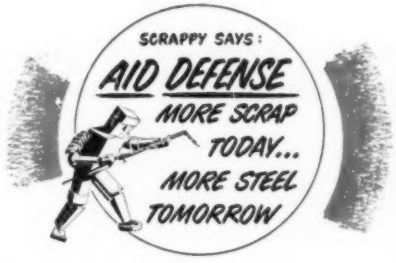
This is proved by the results obtained with MX to date. In producing many millions of parts of many different kinds, cost reductions have run as high as 42%. Usually the figure runs around 10 to 15%—but, without exception, cost savings have been recorded in every instance MX was given a thorough trial. That's why we feel safe in saying that MX will cut the cost of *any* part you now machine from ordinary Bessemer screw stock, even though MX costs a little more.

Give MX a thorough trial. Prove on your own machines that MX will reduce part cost by increasing production; will reduce machine down-time by prolonging tool life; will often eliminate extra finishing operations by assuring better part finish; will minimize rejections by providing closer dimensional accuracy.

U·S·S Free-Machining MX is being produced in all the popular screw stock sections and sizes. It is sold in cold-finished form by your regular supplier as "MX" or under his own identifying trade name. In hot-rolled form MX is available direct through our nearest district sales office.

Now, when production is more important than ever—

speed up the job and do it better with MX

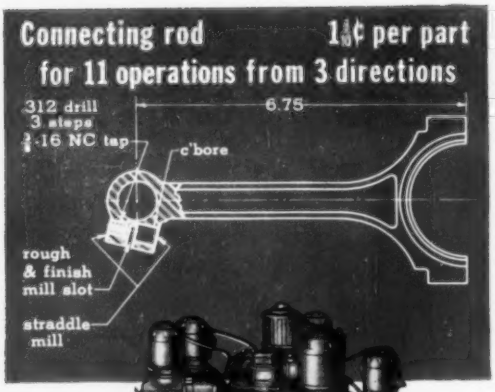


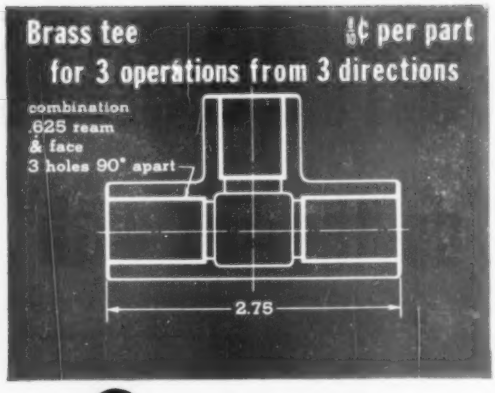
USS

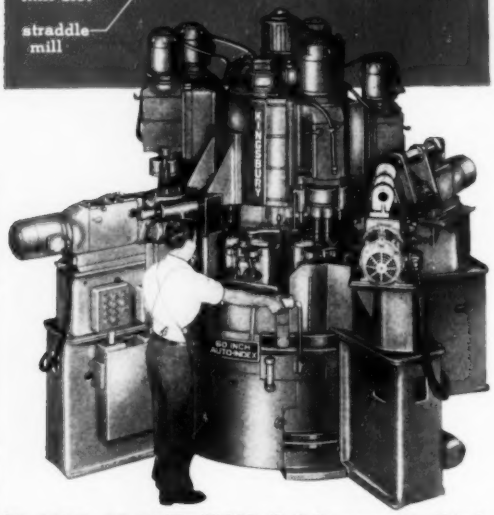
AMERICAN STEEL & WIRE COMPANY, CLEVELAND • COLUMBIA STEEL COMPANY, SAN FRANCISCO
TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM • UNITED STATES STEEL COMPANY, PITTSBURGH
UNITED STATES STEEL SUPPLY COMPANY, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

1-1385

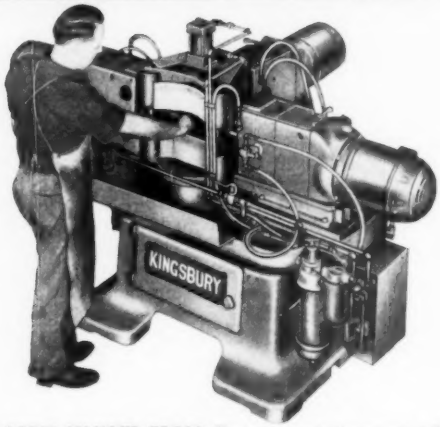
UNITED STATES STEEL







500 PARTS AN HOUR GROSS. Each fixture on this 60-inch "Auto-Index" holds two parts. Horizontal units mill both parts with one cutter. Vertical units on the central column do the holes with two-spindle heads; the counterboring head is inverted.



500 PARTS AN HOUR GROSS. The operator just removes a finished part, replaces it and presses a lever. The machine automatically clamps the work, operates the opposed tools and then the third tool and unclamps the work. There is no indexing.

How much do you pay for

A study of four special drilling and tapping machines that produce at the same rate: 500 parts an hour gross

Dear Sir:

At 80% efficiency each of these Kingsburys averages one finished part every nine seconds. What would that much production cost you?

Each drawing shows the cost for the man and his Kingsbury — no power or overhead. The cost for each man is the same — one 400th part of today's national hourly wage rate. (The 400 is from 3600 secs. in an hour ÷ 9.)

The difference in costs is in the machines, of course. Notice how small this difference is — just one cent between the highest and the lowest, the Connecting Rod and the Brass Tee.

What a difference

Yet the total price of the Rod machine is *seven times* that of the Tee machine. The Rod machine is a massive affair — an 84-inch base with four knees and a central column, nine operating units and a 60-inch power index unit with ten work fixtures that alone weigh 1.2 tons. The Tee machine has just a 68-inch base, three drilling units and one work fixture.

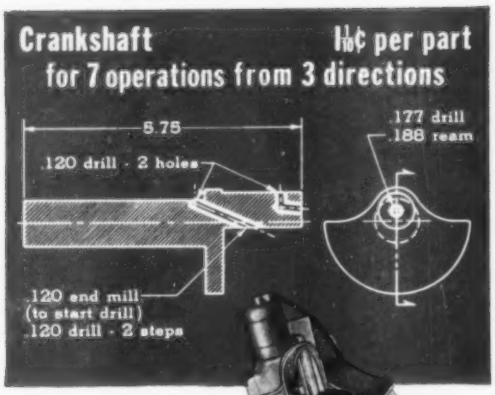
But in unit costs the difference is just one cent, on the basis of amortizing the entire investments in machine and tooling over 6000 hours, a fraction of the useful lives.

Naturally your figuring might be different. But on a high production basis your costs should be close to ours. With low production — well, that's something else again.

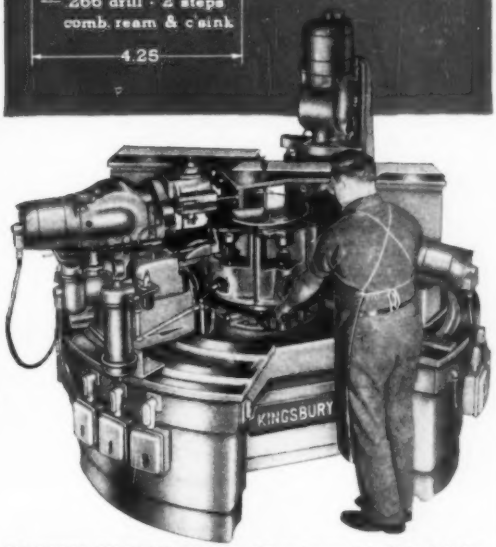
Meets your specifications

All four of these Kingsburys have the same hourly production rate — 500 parts gross or 400 parts at 80% efficiency. We picked them this way on purpose for this comparison.

Actually we design, build and tool each machine to meet each customer's specifications — the operations he



500 PARTS AN HOUR GROSS. A 20-inch power index table has seven fixtures. Three horizontal units end mill and drill the long .120 hole. The inverted angular unit drills two .120 holes. Two hidden angular units drill and ream the .188 hole.



500 PARTS AN HOUR GROSS. All units on this 20-inch index machine are off the radial lines through the fixtures. Three horizontal units for the hole are 20° left. Another for the slot is 30° right. The vertical unit that mills the notch is 10° right.

9 seconds of production?

names, the production rate he names.

Among other things, each of these customers wanted operations from three directions in one chucking. It was easy for the Brass Tee since each hole needed just one operation. A non-index machine with three automatic drilling units did the trick.

It takes ingenuity

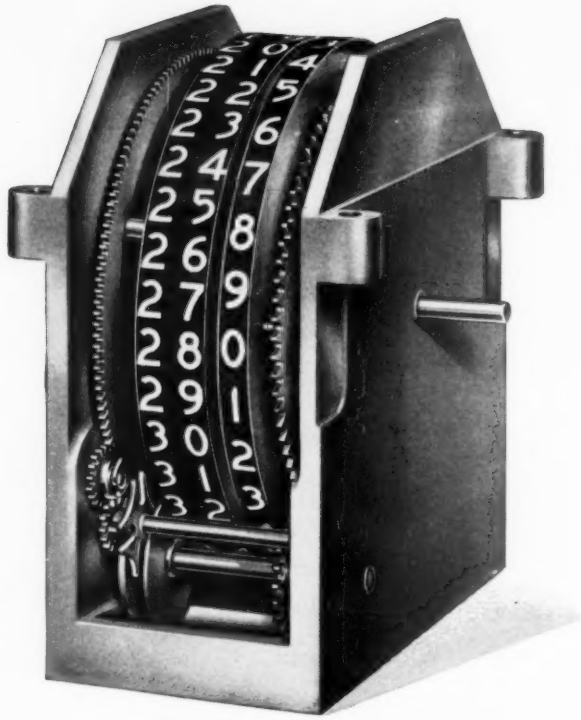
The other three machines had index tables, so it took more ingenuity to work from three directions. The Connecting Rod machine has the usual horizontal and vertical units plus a vertical unit with an inverted auxiliary head that counterbores from below. The units for the Crankshaft are horizontal and at two different angles. For the Distributor Base one unit is vertical and the others are horizontal but at angles to the radial center lines through the work fixtures.

That is, of course, just part of the problem. It takes ingenuity to design a fixture that will hold the work firmly, locate it properly, and still leave room for the tools to operate and the chips to escape. It takes ingenuity to mount all fixtures in exact location on the index table so that all finished parts are fully accurate and uniform. It takes ingenuity on this type of equipment to locate tools to close tolerances.

We feel sure we have the ingenuity to design, build and tool a machine that will meet your requirements.

Sincerely,
Kingsbury Machine Tool Corp.
97 Laurel Street, Keene, N. H.

KINGSBURY
AUTOMATIC DRILLING & TAPPING MACHINES
for Low-Cost High Production



It helps Gunners to "Bear On" Target"

Added Evidence that—

Everyone Can Count on VEEDER-ROOT

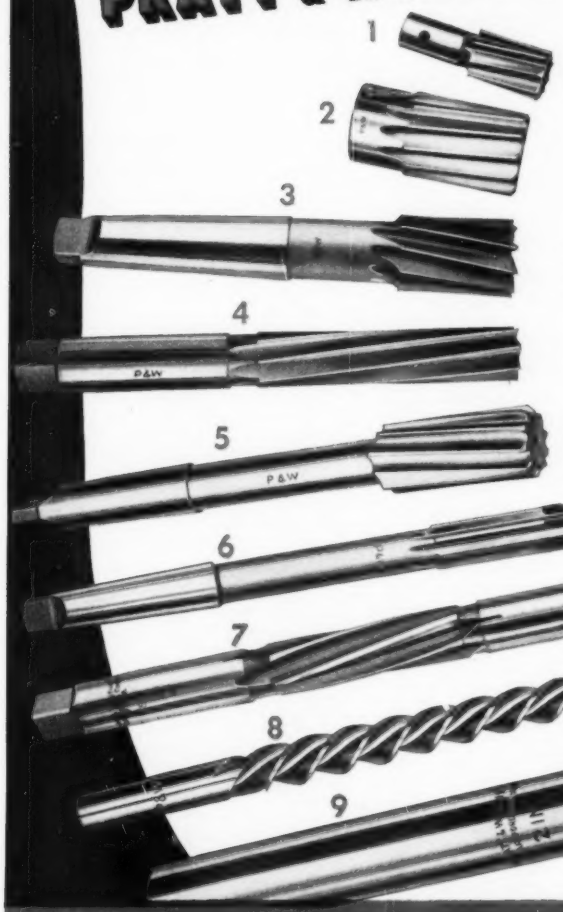
This is a 360-degree bearing counter . . . equipped with high-speed Geneva transfer and large, readily readable figures . . . which speeds the work and heightens the accuracy of gunnery. And it might well be adapted to bring the same advantages to many other operations in defense work.

Now if your imagination is stirred by this suggestion, then you can count on Veeder-Root to help you add up to something that will really *count to YOUR advantage.*

VEEDER-ROOT INCORPORATED
"The Name That Counts"
HARTFORD, CONN. • CHICAGO • GREENVILLE, S. C.
Montreal, Canada • Dundee, Scotland
Offices and agents in principal cities

"Counts Everything on Earth"

Standardize on PRATT & WHITNEY REAMERS



—they have the UNIFORM QUALITY, PRECISION AND LONG LIFE required to meet Today's Critical Needs

1 Stub Screw Machine Reamers
2 Shell Reamers with Spiral Flutes
3 Jig Borer Precision End Cutting Reamers
4 Hand Reamers with Spiral Flutes
5 Blue Helix Fluted Chucking Reamers
6 Carbide Tipped Fluted Chucking Reamers
7 Expansion Hand Reamers with Spiral Flutes
8 Helical Taper Pin Reamers
9 Camlock Adjustable Chucking Reamers with Serrated Blades

PRATT & WHITNEY

Division NILES-BEMENT-POND COMPANY

WEST HARTFORD 1, CONNECTICUT, U. S. A.

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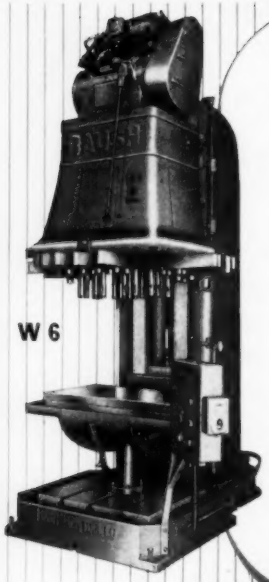
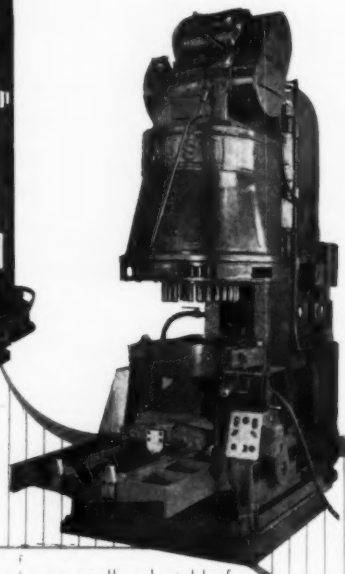
GREATER PRODUCTION

THAT'S A "MUST" IN BAUSH "W" TYPE MULTI-SPINDLE MACHINE TOOLS!!



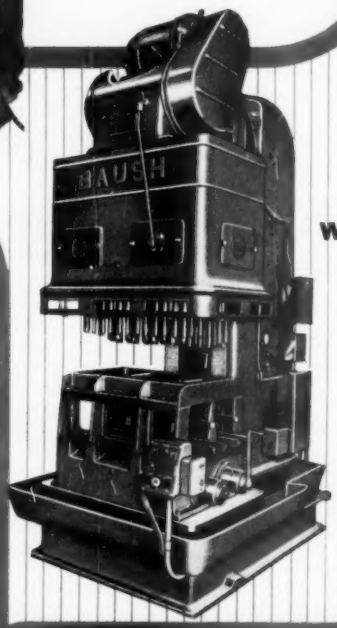
W 6



W 7

These exceptionally versatile multi-spindle drilling and tapping machines fit the needs of nearly all manufacturers for "greater production at lower costs."

Essentially designed and built for heavy duty and hard usage, the Baush "W" Type machines are known for their rigidity, simplicity, accuracy and ease of operation.



W 8

Baush "W" Type machines are especially adaptable for both flange drilling and rectangular hole layouts. Available in 3 sizes, shown in specifications, with adjustable arms to handle drilling of hole centers that constantly vary — or with master-bored cluster plate having spindles in fixed pattern to fit one operation. Horsepower capacities are graduated to cover predominant drilling operations. • Spindle heads are of adjustable, joint driven type, with slip sleeve spindles or adjustable arms that can be furnished in various standard sizes to meet work requirements. "W" Type machines are arranged for 18" maximum stroke of heads — adjustable feed rates — 2 speed geared yokes and can be adapted for tapping. Either adjustable knee tables, box tables or rotating tables are available.

Also furnished as single way, 2-way or 3-way machines.

SPECIFICATIONS OF STANDARD W-TYPE MACHINES

	W-6	W-7	W-8
Maximum Horsepower Capacity for Spindle Drive	10 H.P.	20 H.P.	30 H.P.
Top of Base to Bottom of Head Flange, Head up	62"	55"	53"
Max. Standard Stroke of Head	18"	18"	18"
Overall Height of Machine with low base	139"	141"	150"
Approx. Net Weight of Machine (Lbs.)	17,000	24,000	29,000
Head Sizes Available— Measurements taken between Spindle centers as follows: At Side, S. At Front, F.	18"S. x 24"F. 18"S. x 36"F. 24" round	20"S. x 30"F. 20"S. x 45"F. 36" round	20"S. x 30"F. 28"S. x 54"F. 36" round

BAUSH

MACHINE TOOL CO.

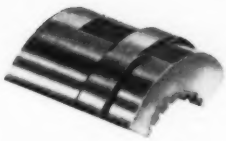
SPRINGFIELD 7, MASSACHUSETTS

HARDINGE
ELMIRA, N.Y.

STANDARD EQUIPMENT in
Progressive Screw Machine Plants

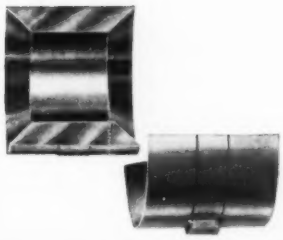
The Only MASTER COLLET
With No Work Pressure on the Screw.

Style "S"
Master Collets and Pads



Pads Interchangeable Among
Different Makes of Automatics

Style "B"
Master Feed Fingers and Pads



HARDINGE BROTHERS, INC., ELMIRA, N. Y.

How to maintain quality standards in today's expanding production

Johansson

GAGE BLOCKS

In precise measurements — as laboratory standards, or for regular checking of tools and gages — you can insure exacting accuracy and guard against costly rejects by equipping each department with Johansson Gage Blocks. Even with today's need to expand production, you can maintain established quality standards by adding Jo-Block protection whenever you add new men or machines.

Jo-Blocks are made in 3 guaranteed accuracy standards: ±.000002", .000004", and .000008" per inch. Many accessories extend their usefulness. Write for catalog. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

We urge buying through the Distributor

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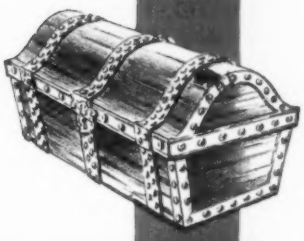
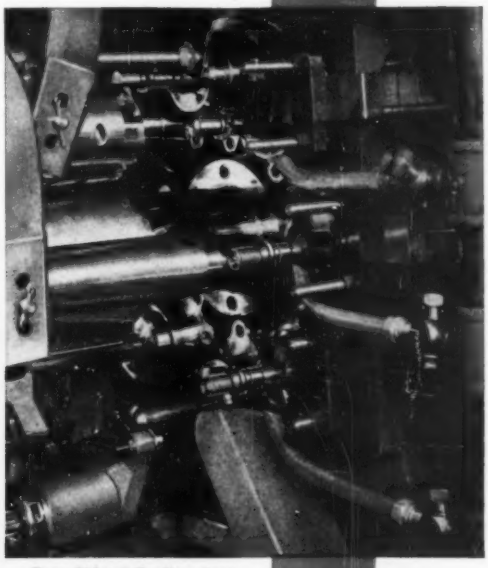
PIECES FROM EIGHTS



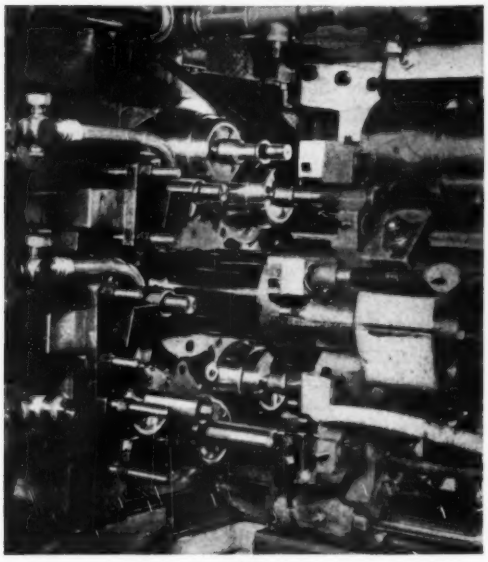
The first eight spindle bar automatics were introduced in 1930 by the late Frank L. Cone, founder of the Cone Company.

CONOMATIC Eights have had the usual opportunities available to any production tools that can handle added requirements and responsibilities.

With more tool positions than other "automatics", Eight Spindle CONOMATICS have an advantage in taking on, at one chucking, operations that save the costs of second handling.



Rear Side of Tooling Area



Front Side of Tooling Area

The milling and stamping operations performed by the 1⅝-EIGHT, on the piece shown, did not require stopping the spindle. The dependable performance of CONOMATICS makes such money-saving operations well worthwhile.

A Comparison of ALL Automatics is in favor of Cone

Conomatic } CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

FOR RAPID, ECONOMICAL DUPLICATION OF SMALL PARTS *that require accurate interchangeability ...with minimum effort!*

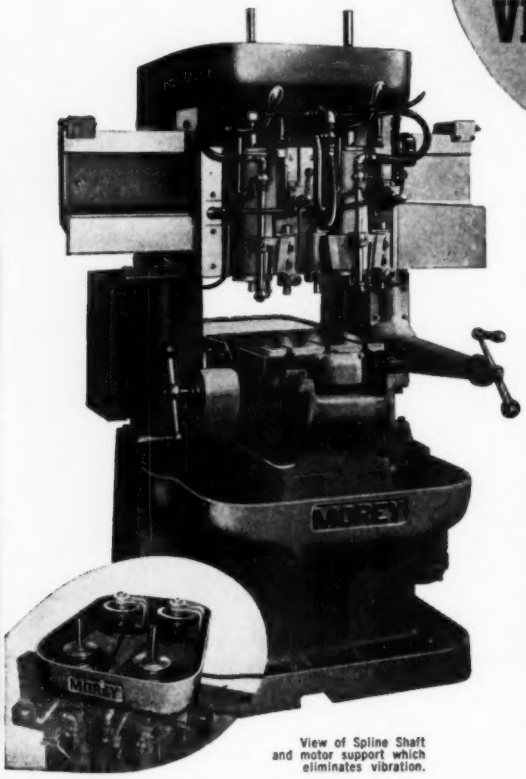
INVESTIGATE

Morey

12-M DOUBLE SPINDLE HIGH SPEED

VERTICAL PROFILER

and MILLING MACHINE



View of Spline Shaft and motor support which eliminates vibration.

More than 40 years of experience in designing, developing and building fine machine tools are incorporated in this dependable, time saving Profiler and Miller.

Over 2000 of these efficient machines are giving top results throughout the world . . . accurately duplicating aircraft and gun parts, etc., from a flat master.

CHECK THE MOREY PROFILER'S IMPORTANT FEATURES:

- *Balanced Cross-Slide*
- *Rigid and Vibration-free*
- *Anti-friction bearings throughout*
- *Spline shaft spindles*
- *Hardened steel ways on Cross-Slide*
- *One-shot lubrication*
- *Built-in coolant system*
- *V-Belt spindle drives*
- ● ***6 WEEK DELIVERY!***

PARTIAL LISTING OF SPECIFICATIONS:

Working surface of table	14"x18"
Travel of table, longitudinal (with stops)	23" 17¾"
Distance between spindles, center to center	12"
Spindle speeds (6)	2700-1800-1350-850-600-425
Cross rail traverse movement	32"

Motor Drive

Write us today for fully illustrated and diagrammed circular that supplies complete information!

MOREY *...for more value!*

MOREY MACHINERY CO., INC.
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All these

and gages too!

Yes, only GREENFIELD with its GEOMETRIC Division manufactures in its own plants, a complete line of Cutting Tools plus Gages! Yes, only GREENFIELD could duplicate the above tooling and top it off with all necessary Gages.

REGULAR STOCK ITEMS

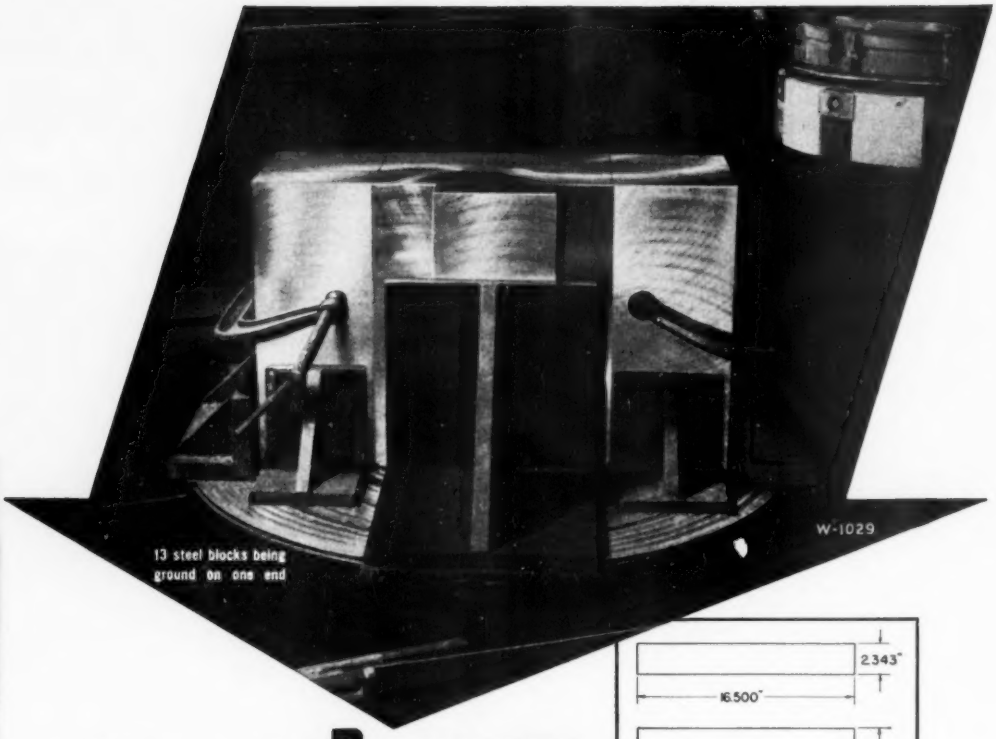
	Capacity From	Capacity To
TAPS and COLLAPSING TAPS	0–80	8½"–8
DIES and DIE HEADS	0–80	6"–7
GAGES—THREAD	0–80	1½"–6
GAGES—PLAIN	.059"	4.510"

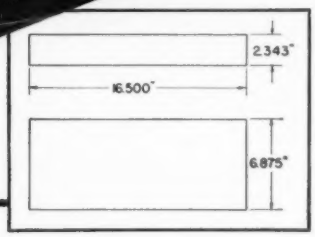
	Capacity From	Capacity To
DRILLS	#80	3½"
REAMERS	7/0	2½"
END MILLS	1/16"	2"

BUY TOOLS WITH *CONFIDENCE* BUY *GREENFIELD* TOOLS

GREENFIELD TAP AND DIE CORPORATION

GREENFIELD, MASSACHUSETTS





Put it on the BLANCHARD

√. . . for stock removal

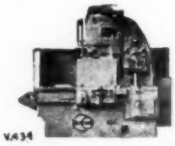
These annealed steel blocks were ground on all 6 surfaces on a Blanchard No. 18 Surface Grinder. Rough size was 16¾" x 7⅛" x 2½". *37.439 lbs. of metal were removed from each piece!*

√. . . for speed

Thirty of these steel blocks were ground on all 6 surfaces in 42½ hours. *This is a floor-to-floor time of only 85 minutes each.* All surfaces were ground square within .002", and flat and parallel.

√. . . for comparison

Let Blanchard grind some sample parts, or give you estimates from prints of your surface machining jobs. A comparison with your present methods may surprise you!

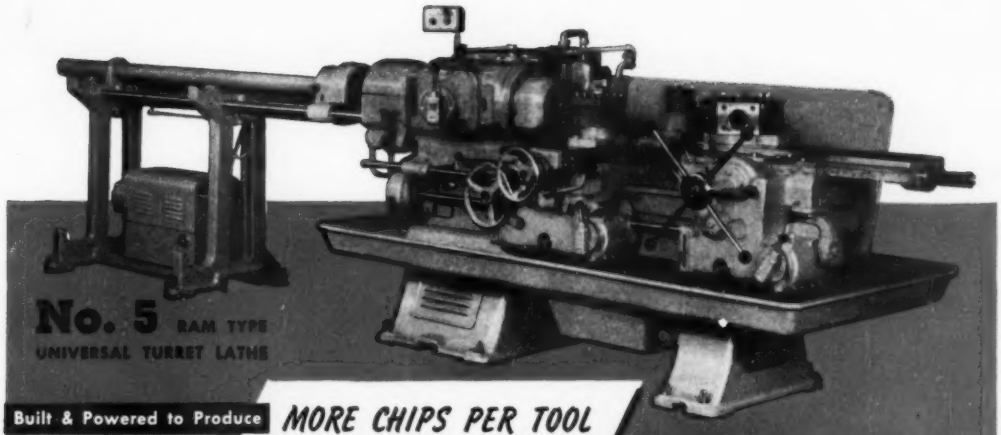


NO. 18 BLANCHARD SURFACE GRINDER

Send for your free copies of "Work Done on the Blanchard," fourth edition, and "Art of Blanchard Surface Grinding."

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY 64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.



No. 5 RAM TYPE
UNIVERSAL TURRET LATHE

Built & Powered to Produce

MORE CHIPS PER TOOL
MORE PIECES PER HOUR
MORE PROFIT PER JOB

than any other turret lathe of comparable size

Jones & Lamson offers the best investment in turret lathes. They are backed by the "know how" of a firm, long predominant in the field, whose many pioneered and perfected developments have brought about far-reaching advances in the art of cutting metal.

Every feature of these lathes has been developed through long-range research and practical experience in production turning. Their superior performance stands out over any other machine of comparable size, because they are built to hold their accuracy at the highest speeds and feeds possible with modern cutting tools — with ample reserves to anticipate new cutting techniques. Jones & Lamson Turret Lathes have a well-earned reputation for ease of operation, low operating costs and year-round dependability. They are recognized for their advantages in *SPEED, POWER, RIGIDITY AND REPETITIVE ACCURACY.*

They will pay for themselves quickly through savings in direct costs alone!

- Single lever, speed selector — 12 spindle speeds 30 to 1500 RPM or 20 to 1000 RPM
- 15 HP constant speed motor — ample horsepower available at all speeds
- Single lever carriage feed selector — 9 reversible longitudinal and 9 cross feeds
- Single lever hexagon turret feed selector — 9 longitudinal turret feeds
- All longitudinal and cross feeds automatically disengaged against positive stops
- Heavy-duty spindle mounting with rugged preloaded anti-friction bearings
- Heat-treated, precision-finished, long-wearing alloy steel gears
- Multiple-disc type forward and reverse clutches — automatic spindle brake
- Husky, multiple-spline transmission shafts with anti-friction bearings
- Hardened and precision ground steel ways — $12\frac{1}{2}$" in overall width
- Bridge-type carriage for multiple tooling at rear of cross slide
- 4-position, quick-indexing square turret — all faces tapped for extra tool blocks
- Hexagon turret clamped automatically on forward stroke of ram
- Automatic lubrication system with forced feed to all sliding bearings
- Complete coolant system — automatic internal delivery to each hexagon turret face
- Adjustable graduated handwheel dials and clips and chrome plated handwheels, dials and levers

Write to Dept. 710 for Complete Information

Turret Lathe Division **JONES & LAMSON**
MACHINE COMPANY
Springfield, Vermont, U.S.A.
MACHINE TOOL CRAFTSMEN SINCE 1835

This roll looked perfect...

until SUPERFINISH revealed these defects!

Everybody said it was as perfect a finish as you'd ever see. A 12" steel roll ground down to a smoothness of less than 2 micro inches—dazzlingly reflective from end to end. Not a visible defect *—on the surface.*

But when SUPERFINISHING began, some interesting marks appeared—longitudinal flat spots—defects produced by the prior operation and then covered up by the heat of grinding.

SUPERFINISH brings these hidden troubles out in the open—out where you can see them and recognize the cause. And if your troubles are not too serious, SUPERFINISH can correct them economically and fast.

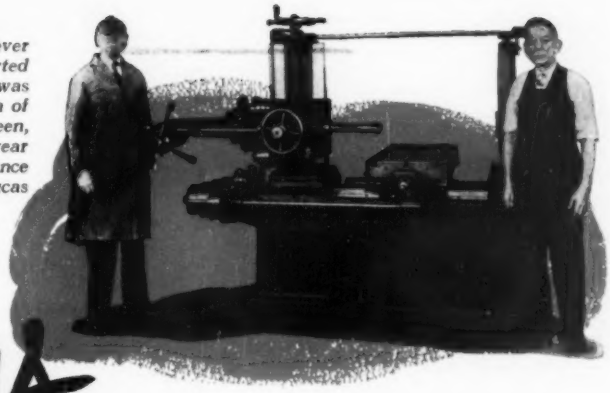
If you have fine finish requirements it will pay you to write for the booklet "Wear and Surface Finish."

THE GISHOLT ROUND TABLE
represents the collective experience of specialists in the machining, surface finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

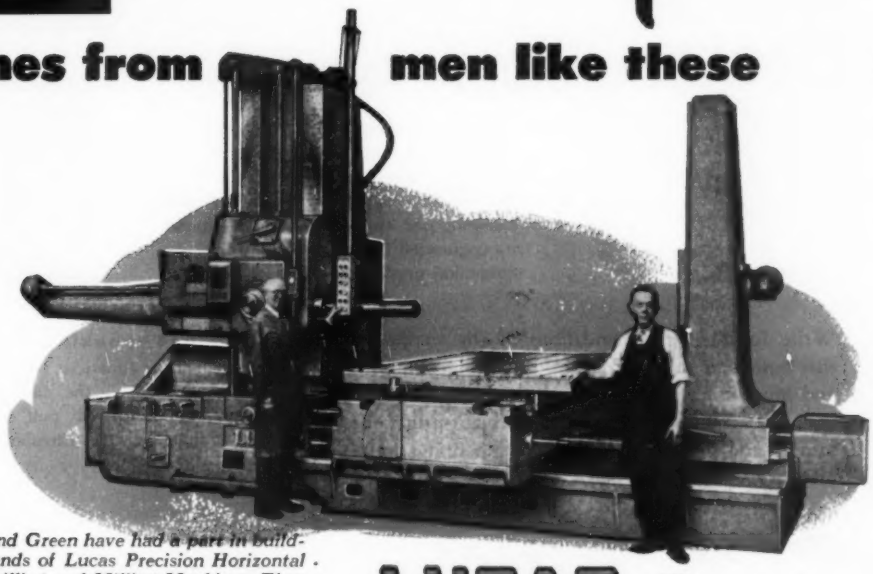
Here is the first Lucas Machine ever built. When Ed Wilde (left) started working at Lucas, this machine was brand new. Today Wilde is foreman of our Lathe Department. H. T. Green, Tool Room foreman joined us a year later. They have a combined experience and know how of 99 years on Lucas Machines.



Lucas Leadership

51 YEARS LUCAS CLEVELAND ONE HUNDRED

comes from men like these



Wilde and Green have had a part in building thousands of Lucas Precision Horizontal Boring, Drilling and Milling Machines. They represent the concentration on the development and improvement of a single product over half a century that has kept Lucas far ahead of the parade.

LUCAS *Precision*

HORIZONTAL BORING, DRILLING AND MILLING MACHINES

LUCAS MACHINE DIVISION • THE NEW BRITAIN MACHINE CO. • CLEVELAND 8, OHIO

Your broaching question needs Three right answers

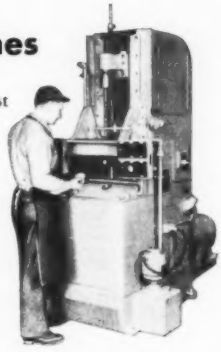
the *American* way gives you all three

1 The RIGHT Tools

Your first right answer from American is the precision quality in every American-engineered broach. American engineers and skilled workers have over thirty years of "Know-How" in design and manufacture, which assures you of the *right* broach for the job.

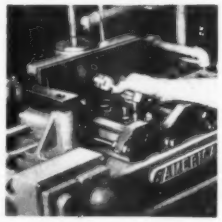
2 The RIGHT Machines

The next right answer is the machine most capable of performing your job. To select the correct machine, American engineers can choose from *more than 35* standard internal and surface type machines. If yours is a special or unusual job, they can design and build a *special machine* to fit the operation.



3 The RIGHT Fixtures

A highly important answer to broaching accuracy is the work holding fixture. Whether a simple manually operated one — or a complex fixture with automatic clamping and ejection, American fixtures are engineered for fast, accurate and economical production.



Write for the recommendations of the company that builds all three, broaches, broaching fixtures, and broaching machines, for the right answers to your broaching question. Send a part-print or sample and hourly requirements. No obligation, of course. Address Dept. A.

. . . and speaking of threes

Ask about the American 3-Way broaching machine . . . the machine that's easily adapted to push, pull, or surface broaching. Write for Circular No. 100.

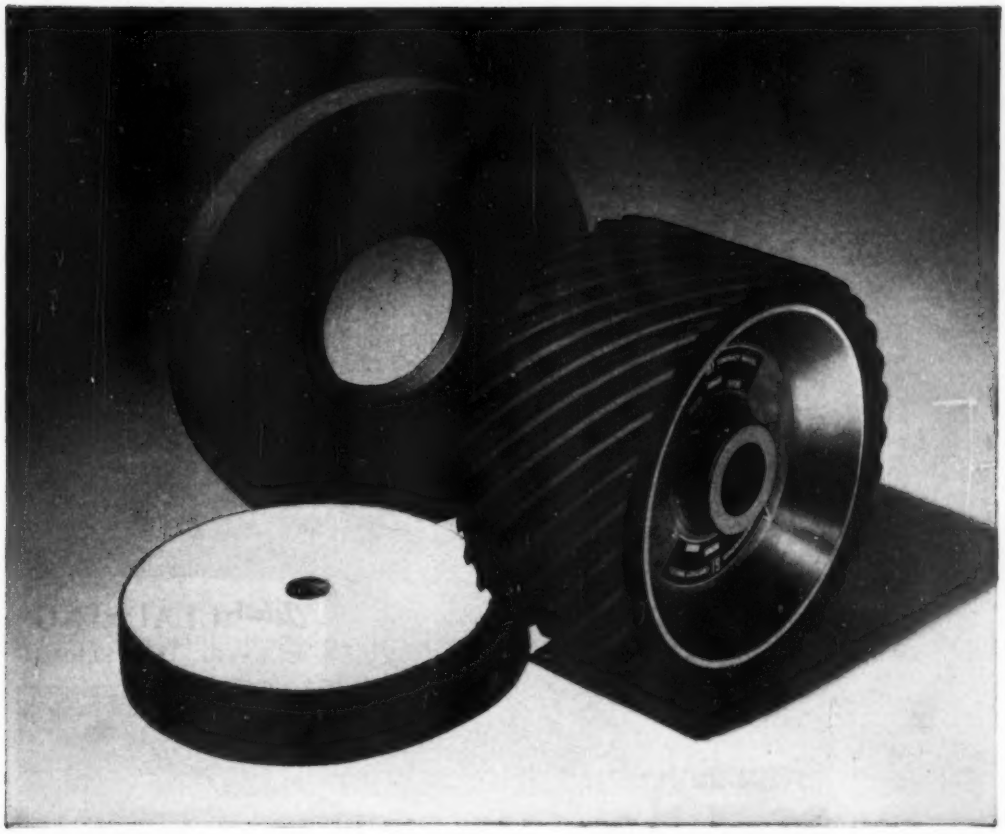
AMERICAN *American* BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

SUNDSTRAND

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery



Too many wheels?

Not when each wheel represents a basic method of abrasive application. The "61" Contact wheel is used with an abrasive belt. The Set-up wheel, with grain applied to its periphery, is ideal for many types of polishing. The grinding wheel is perhaps most familiar.

Each wheel is specially designed to perform a specific job better, faster and at less cost. *All* of these are available from one source... CARBORUNDUM. For, only CARBORUNDUM makes all abrasive products, from which you can select those best suited to your operations.

That's why more concerns are looking to CARBORUNDUM for the right answer to every abrasive need. Next time... call in CARBORUNDUM... and be sure.

Only CARBORUNDUM
TRADE MARK

makes ALL Abrasive Products... to give you the proper ONE

"Carborundum" and "Aloxite" are registered trademarks which indicate manufacture by The Carborundum Company, Niagara Falls, N. Y.

Atlas-CLAUSING
12″ LATHE 6300 SERIES

Atlas-CLAUSING
12″ LATHE 4800 SERIES

ANNOUNCING

Atlas

CLAUSING 12″ LATHES

CLAUSING—a name highly respected for years in thousands of plants—is now a division of Atlas. Atlas-Clausing will continue with the advanced features that are responsible for the Clausing lathe's excellent reputation. And the combined efforts and experience of Atlas and Clausing engineers promise even greater advancements in modern precision lathes.

6300 SERIES

★ 1″ COLLET CAP., 1⅜″ BORE. ★ 12¾″ SWING OVER BED, 7½″ OVER SADDLE. ★ 24″-36″-48″ BETWEEN CENTERS. ★ A.S.A. —L-00 TAPERED KEY DRIVE SPINDLE.

Outstanding construction and performance features include: Bed—heavy, thick-walled with 2 Vee-ways and 2 flat ways precision ground.

Headstock—spindle is forged steel, mounted on selected Timken tapered roller bearings, with ground, hardened nose. Gears are steel, run in bath of oil. Outboard, underneath drive, with dual V-belts. 8 speeds—50 to 1300 RPM. Variable drive (optional) provides infinite variety of speeds between 30 and 1400 RPM. Enclosed quick change gear box, with steel gears and splash lubrication, provides instant selection of 48 threads or feeds, thread range 4 to 224. Acme thread lead screw—supported in gear box by Timken tapered roller bearings.

Apron—heavy, double-walled, automatic, with splash lubrication, positive clutch, steel and cast iron gears.

4800 SERIES

★ ½″ COLLET CAPACITY, 25 32″ BORE. ★ 12¾″ SWING OVER BED, 7½″ OVER SADDLE. ★ 24″-36″-48″ BETWEEN CENTERS. ★ 1½″-8 THREADED SPINDLE.

Outstanding construction and performance features include: Bed—heavy, thick-walled with 2 Vee-ways and 2 flat ways precision ground.

Headstock—spindle is ground alloy steel, mounted on selected Timken tapered roller bearings. Countershaft has friction clutch and brake for stopping spindle without stopping motor. Countershaft spindle turns on ball bearings. V-belt drive. 12 speeds—43 to 2270 RPM. Quick-change gears, 48 thread selections, 4 to 224. Gear box shafts are ground steel, turn on ball bearings. Gears are ½″ wide steel. ⅜″ lead screw with Acme thread.

Apron—heavy, double-walled, automatic with splash lubrication, positive clutch, steel and cast iron gears.

Catalogs sent on request.

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More than a half century of x-ray development, including the pioneering of industrial x-ray apparatus, is reflected in this highly versatile array of industrial x-ray units. Chances are, there's a need for x-ray in your business. Lower your production costs and improve quality. Let one of General Electric's highly-trained application specialists appraise your inspection needs. For full information write — X-Ray Department, General Electric Company, Milwaukee 14, Wisconsin, Box AB-12.

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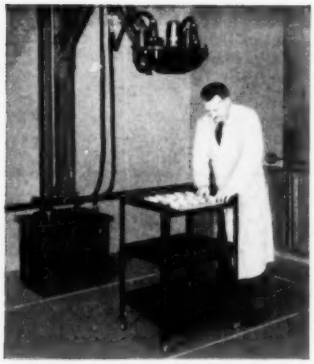
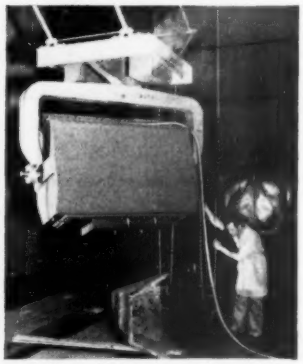
XRD-3—This x-ray diffraction apparatus provides for the use of modern techniques for the study of crystal structures and the relation of these structures to the physical properties of nearly all solid materials.

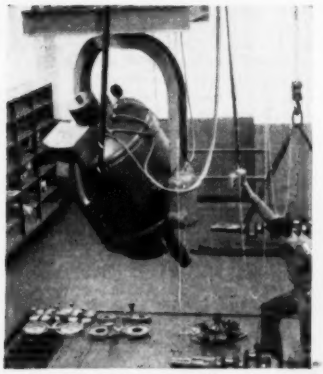


OX-140 — Extremely versatile and efficient . . . with a continuous operating range of from 30 to 140 kvp at 5 to 10 ma. Available in six different models. Invaluable for inspection of low-density metal and other materials.

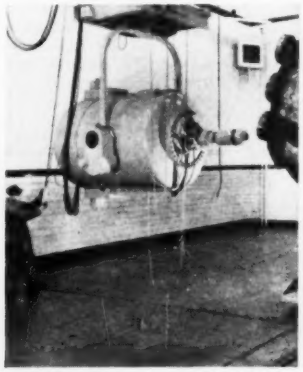
OX-250 — The world's most popular industrial x-ray unit . . . with an operating range from 60 to 250 kvp, 2.0 to 10.0 ma. This rugged unit is available in seven different mountings to meet varied industrial needs.



OX-400 — Bridges the gap between low and high-voltage equipment. Where cost prevents installation of higher-voltage equipment, yet penetration of lower-voltage units is insufficient, this 400 kvp apparatus is a natural choice.



RESOTRON 1000 — The million-volt unit which opened a new era in industrial radiography. Featuring a resonant transformer, multi-section tube, and gas insulation, it operates at 1000 kvp, 3.0 ma, continuous rating.



RESOTRON 2000 — As with the Resotron 1000, this two-million volt unit permits the use of the large-field, reflected x-ray beam for simultaneous radiography of many objects in a single exposure . . . Faster, with greater penetrating power.

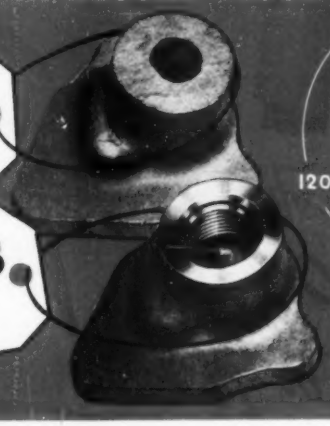
15 MILLION-VOLT BETATRON — The present-day ultimate where maximum sensitivity is paramount. Your best choice in magnetic accelerators, for speed, sensitivity, and field size for the radiography of heavy-section thicknesses.

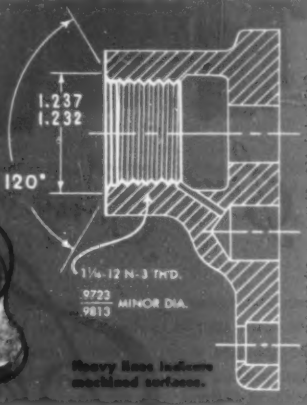
THE P&J 3U AUTOMATIC

MACHINES THIS JOB IN RECORD FLOOR-TO-FLOOR TIME

RUSH

2 MINUTES FLAT





Five precision-operations are specified on these aluminum alloy Auxiliary Pump bodies for Jet Aircraft Engines.

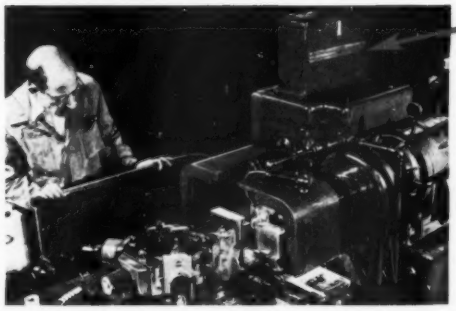
Producing this work to difficult "aircraft-quality" standards presented no problem to Chandler-Evans' tool engineers:

They simply tooled up a P&J 3U AUTOMATIC

— including a P&W Precision Ground Thread Tap and the P&J Automatic Tapping Control unit you see mounted on the top of the machine (a combination which easily maintains the required close tolerances for a Class 3 thread on a long production run)

— and machined these castings well within the unusually high-precision limits insisted upon by the Aircraft Industry

— in the record floor-to-floor time of 2 minutes flat!

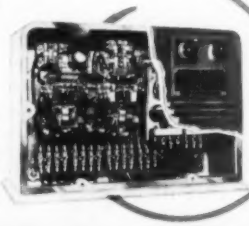


Operations

as indicated by heavy lines in the drawing:

1st — DRILL
2nd — FACE
3rd — BORE
4th — C'BORE, C'SINK
5th — TAP

Production-tapping for Class 3 thread is accomplished by means of this P&J-designed Automatic Tapping Control Unit.



POTTER & JOHNSTON Co.

Subsidiary of PRATT & WHITNEY
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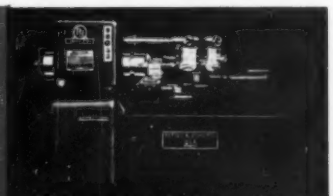
PAWTUCKET, RHODE ISLAND, U.S.A.

Precision Production Tooling for 53 years



All the precision, stamina, speed and high-production possibilities you could ever hope for are built into the P&J 3U Automatic for profitably machining castings and forgings up to 6" in dia.

Sing a Song of

Surface Plates

General Manager

Chief Inspector

Purchasing Agent Superintendent

they all sing praises of

NORTON

Surface Plates

If you haven't yet heard a song about surface plates, it may be because you haven't adopted Norton Ceramic Surface Plates in your plant.

We cannot guarantee that you will develop a quartet to join the Society for the Preservation of Barbershop Singing in America, but you can be sure of finding four who will sing the praises of Norton Ceramic Surface Plates.

Your General Manager—and other top management men—will find these hardest of all surface plates in tune with today's needs for maximum production with optimum accuracy. Made of one of the hardest substances known, these ceramic surface plates show off to best advantage on your severest production gaging and blueing operations.

Your P. A. will be humming with satisfaction over the way these ceramic surface plates pay off in extra-long, trouble-free service. In both laboratory and field tests Norton surface plate life has been shown to be at least 40 times that of the best competing type.

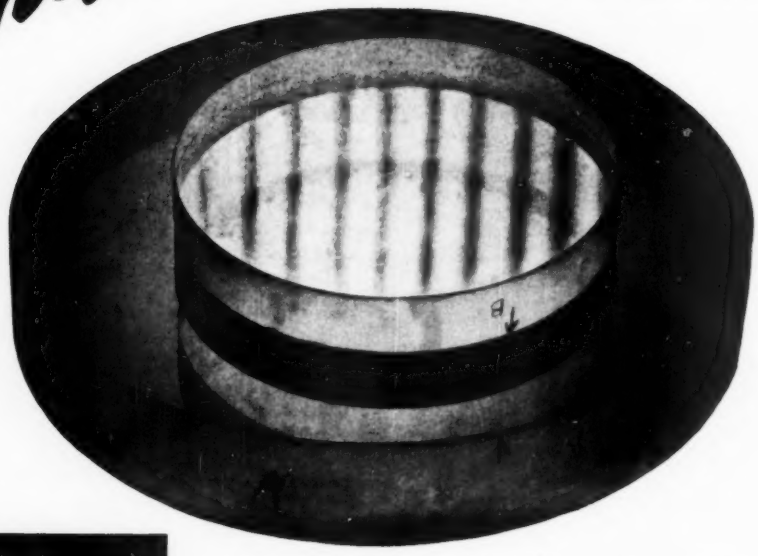
Your Superintendent will like the harmony in his department that comes from men working with the easy-to-use Norton Ceramic Surface Plates. These plates will never sweat nor corrode under any conditions. Greasing is unnecessary and the plates require no protection from moisture. Made of a durable and stable material, Norton surface plates will not warp nor deform; will never give expansion troubles; will not deflect under load.

Your Chief Inspector will really sing for joy over the aid to precision checking operations given by these ceramic surface plates. Offering a new precision standard of continuously smooth surface finish, Norton surface plates allow easy movement of instruments and work across the plate without excessive drag and without vibration. The precision flatness of these ceramic surface plates not only is important to precision measuring operations but also helps prevent wear of expensive instrument bases, gage blocks, and sine bars.

NORTON

NORTON COMPANY, WORCESTER 6, MASS.
DISTRIBUTORS IN ALL PRINCIPAL CITIES

Van Keuren OPTICAL FLATS
are the proof of Precision



Detecting worn spot on amplifying gage anvil.

Checking flatness of lapped shoulder on a shaft with a special 3" diameter x 29.32" hole Fused Quartz Optical Flat.

IF the 10" diameter Van Keuren Master Flat shown above were extended from New York to Boston, the surface would deviate from a true plane less than 1".

Insist on having Van Keuren Fused Quartz Optical Flats. They are beautifully finished and are of superlative accuracy on both sides. They are the best buy.

CATALOG AND HANDBOOK No. 34

IF YOU HAVE A PROBLEM

of testing flat surfaces, send us a sample part for examination and report.

THIS 208-page volume represents 2 years of research sponsored by the Van Keuren Co.

It presents for the first time in history a simple and exact method of measuring screws and worms with wires.

It tells how to measure gears, splines and involute serrations. It is an accepted reference book for measuring problems and methods.

Copies free upon request.

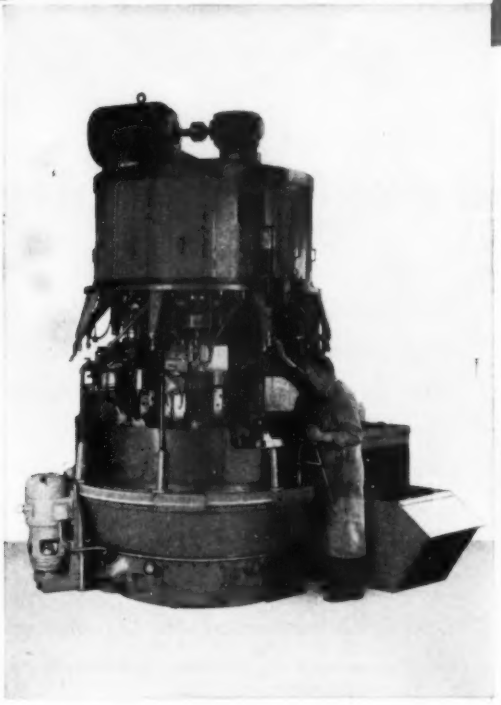
THE Van Keuren CO., 173 WALTHAM STREET, WATERTOWN, MASS.

32nd YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires

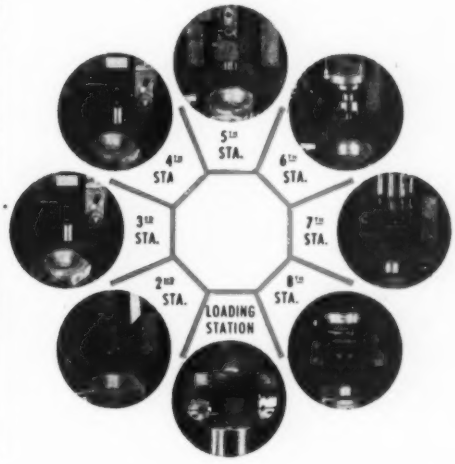
Tradition

32 YEARS OF LEADERSHIP



THE

BULLARD MULT-AU-MATIC METHOD

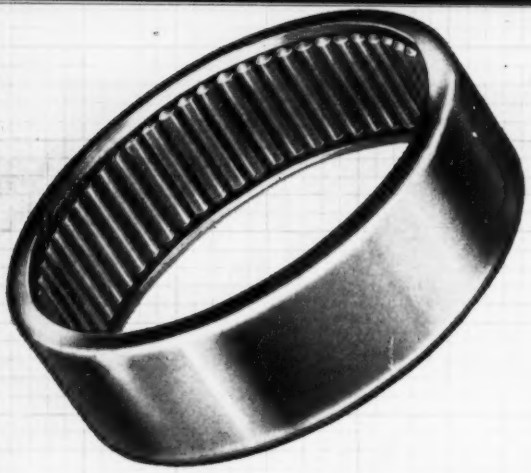


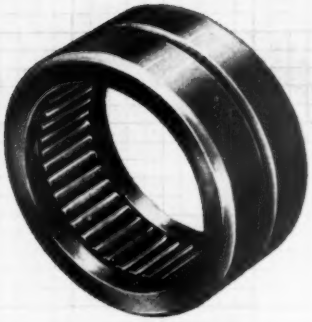
Leaders of Today's Industries have, during thirty-two years, recognized the Leadership of The Bullard Mult-Au-Matic Method. This Leadership has been established on consistent Production, Accuracy, and Efficiency. Economy of operation and Versatility of change-over from one job to another have proved the value of Mult-Au-Matic investment.

Whether it is the pace of Peacetime needs or the more urgent pace of Defense requirements, Mult-Au-Matics have remained key units in efficiently balancing manufacturing volume.

There's a Foresighted story in the 1928 Edition of "The Mult-Au-Matic Method". Write for your copy—Refer to "Tradition".

THE **BULLARD** COMPANY BRIDGEPORT 2, CONN.





a type and size for every need

Torrington Needle Bearings are available in a wide range of types and sizes to give dependable anti-friction performance in a wide variety of applications.

Needle Bearings are especially suited for high speed rotation . . . or oscillation. They offer high load capacity, small cross-section, good retention of lubricant and long service life for all radial loads.

You can accommodate shafts from 5/32" up—retaining all these advantages. Our engineers will be glad to help you pick the right Needle Bearing for your application.

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TORRINGTON *NEEDLE* BEARINGS

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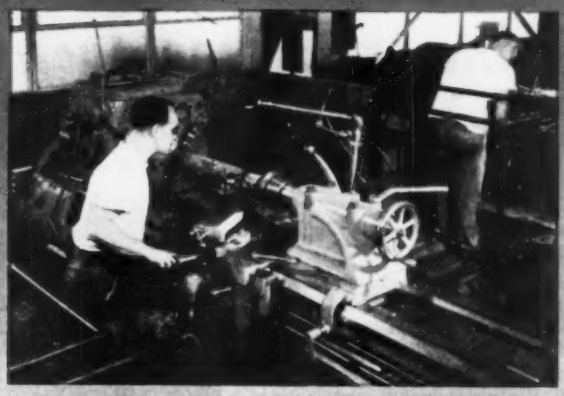
SPRINGFIELD LATHES

on the PAYLOADER

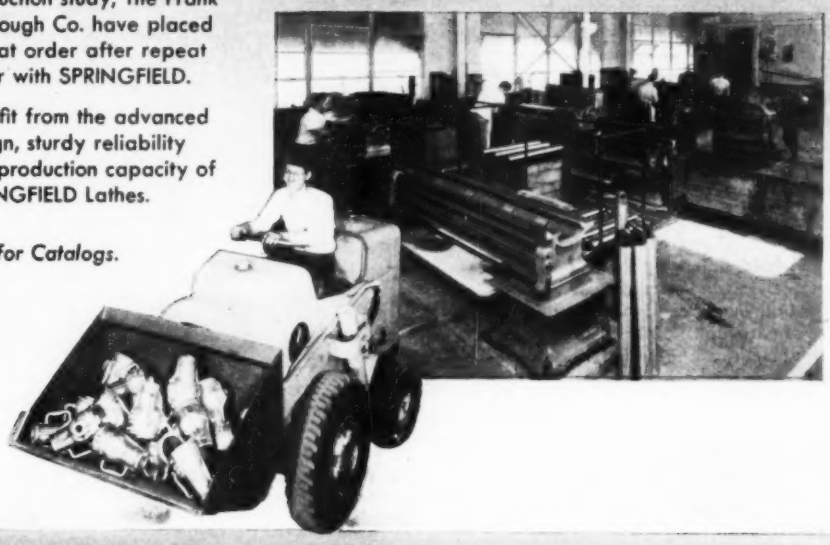
Years of experience in applying engine lathes to the production of various parts for the world-famous **PAYLOADER** have convinced The Frank G. Hough Co., Libertyville, Ill., SPRINGFIELD LATHES are completely satisfactory, extremely versatile and productive.



On the basis of actual records of their installations, operator preference, maintenance cost and production study, The Frank G. Hough Co. have placed repeat order after repeat order with SPRINGFIELD.

Benefit from the advanced design, sturdy reliability and production capacity of SPRINGFIELD Lathes.

Ask for Catalogs.



THE SPRINGFIELD MACHINE TOOL COMPANY

SPRINGFIELD, OHIO, U. S. A.

GENERAL DISTRIBUTORS: BRYANT MACHINERY & ENGINEERING COMPANY, 400 WEST MADISON ST., CHICAGO 6

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NOW... GISHOLT VERTICAL BALANCING MACHINES

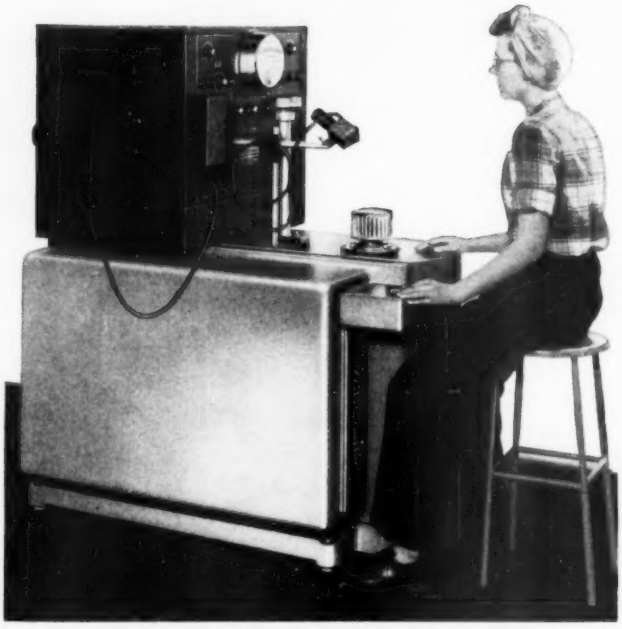
STILL FASTER PRODUCTION BALANCING FOR PARTS UP TO 50 LBS.!

Gisholt leadership in balancing is demonstrated again.

Designed for high volume balancing, these new models locate and measure unbalance with a speed and accuracy unequaled by any other means. Unbalance vibrations as small as .000025" are clearly indicated.

Here's everything for sustained high speed production: compact design . . . meter and angle dial at eye level . . . spindle close to operator for speedy handling of parts . . . all controls efficiently grouped for short reach, less movement, minimum operator fatigue. Machine may be furnished with raised bed for operator to work in standing position.

Using the same proved principle as other Gisholt Balancing Machines, Gisholt Vertical Balancers are available for both static and dynamic balancing of parts up to 50 lbs. Correction equipment can be added where desired. Write for full information.



The Model 1SV1 Vertical Balancing Machine illustrated is one of four basic models of this new type.

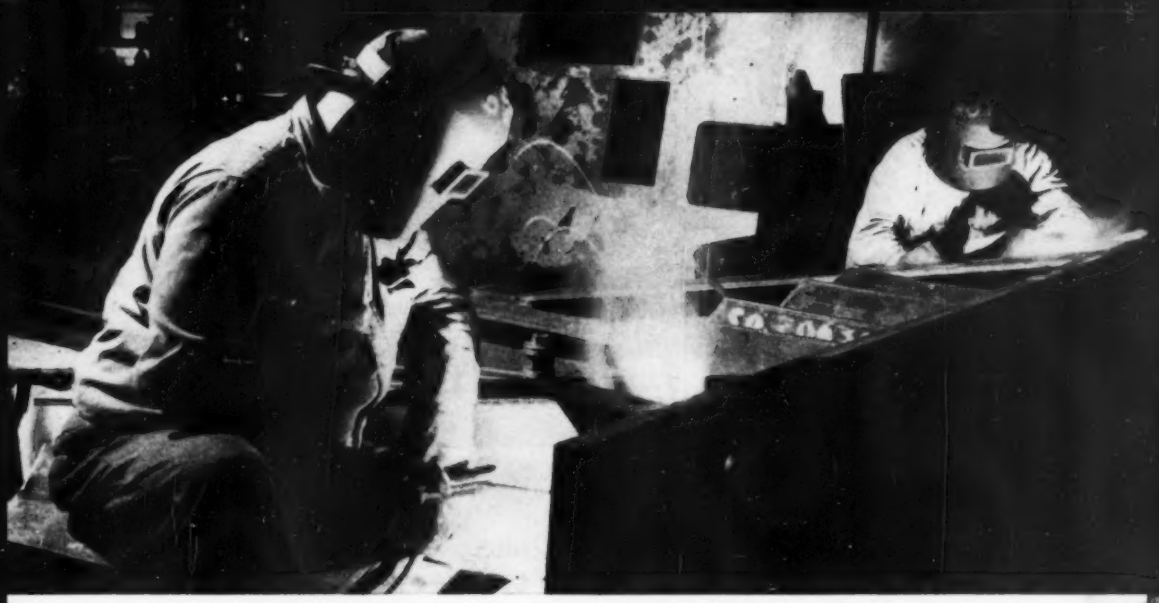
DYNETRIC BALANCERS — GISHOLT — DEVELOPED JOINTLY WITH WESTINGHOUSE ELECTRIC CORPORATION. "DYNETRIC" IS A TRADE MARK REG. U. S. PAT. OFFICE BY WESTINGHOUSE ELECTRIC CORPORATION

✻ **GISHOLT BALANCING SCHOOL.** *Complete courses are now offered, covering the theory and practical applications of balancing to help you with your problems. Ask for details.*

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.*

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

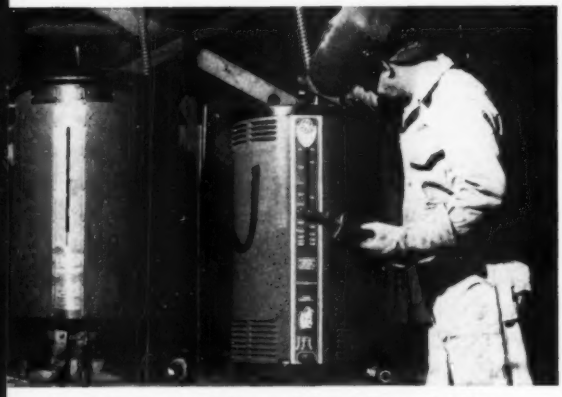
TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES



Here, Alco welders help meet production schedules on locomotive frames, vital to defense, by using G-E a-c welders. AC welders eliminate troublesome arc-blow encountered when welding high-tensile steels with d-c equipment.

100% A-C WELDED!

Here's How Alco Produces Road Locomotive Frames with G-E Welders



Shown above are two of the many G-E a-c welders used at Alco.

Corners can be difficult to weld, but the absence of troublesome arc-blow with G-E a-c welders enables this operator to lay an even corner bead in any position.

Diesel-electric road locomotive frames are 100% a-c welded at the Schenectady, N. Y., plant of American Locomotive Company. Alco welding engineers report that General Electric a-c welders eliminate troublesome arc-blow, make for easy striking, cost less than d-c, use less power and are easily maintained.

Like the American Locomotive Company, you may also find that you can speed production by using G-E a-c welders. For example . . .

YOU CAN WELD BETTER WITH AC

You have complete control of the arc in all positions because G-E a-c welders eliminate troublesome arc-blow. This reduces the danger of undercutting and slag inclusions and produces better welds.

YOU CAN WELD FASTER WITH AC

In almost every case you can use higher currents and larger electrodes. That means more footage. Users report increases of 10 to 50%.

YOU CAN WELD AT LOWER COST WITH AC

G-E a-c welders cost less than d-c equipment of the same rating. They use only one-fourth as much power when idling and have much lower load losses. And because there are no rotating parts, maintenance is practically negligible.

SEE YOUR G-E WELDING DISTRIBUTOR!

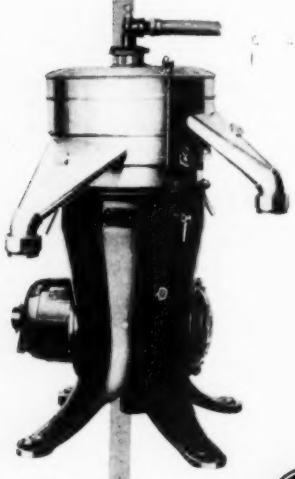
He's listed in the yellow pages of the telephone directory. Just look for General Electric under "Welding Equipment." Your distributor carries a complete line of welders, accessories and electrodes. General Electric, Schenectady 5, N. Y.

GENERAL ELECTRIC

711-17

DE LAVAL OIL PURIFICATION

Profitable Salvage and a Production Safeguard



Purification of cutting oil or other factory oils by De Laval Centrifugal Oil Purifiers is both a salvage and a maintenance operation. The value of being able to re-use purified oil instead of throwing used oil away is obvious. Even more important than the salvage value of the oil, however, are the actual production advantages of having a plentiful supply of oil maintained absolutely free of metallic impurities.

When the oil is cutting oil, the production advantages of De Laval purification include longer tool life—higher permissible cutting speeds—minimized wear on moving parts of machine tools. If the oil is test oil, the tests themselves are more reliable when the oil is kept dry and clean by centrifugal force.

These are only two of the many types of factory oils that yield both salvage and maintenance savings when purified by De Laval machines.

Bulletin MM-1 gives many other examples. Write for your copy.

THE DE LAVAL SEPARATOR COMPANY
Poughkeepsie, New York 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

DE LAVAL *PURIFIERS AND CLARIFIERS FOR FACTORY OILS*

It's a *Pleasure* to *Operate* NIAGARA

- ★ Unbreakable Steel Construction
- ★ Holddown on sizes 36" and larger
- ★ Clean Straight Cuts
- ★ Easy Operation...Lively Action...
- ★ Portable
- ★ Complete Set of Gages
- ★ Cutting Lengths from 22" to 120"
- ★ Capacity 16 and 18 Gage Mild Steel

FOOT SHEARS

Write for the facts on how America's most modern foot shear will help you save time and cut costs.

ASK FOR BULLETIN 80F-A

NIAGARA MACHINE AND TOOL WORKS, BUFFALO 11, NEW YORK

America's Most Complete Line of Presses, Shears, Machines and Tools for Sheet Metal Work

DISTRICT OFFICES: DETROIT • CLEVELAND • NEW YORK

"It happens every time they nab Dinsmore. The guy has a grip like a **JACOBS CHUCK***!"*

IF IT'S A

JACOBS

IT HOLDS

THE JACOBS MANUFACTURING CO., WEST HARTFORD 10, CONN.

Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

Ideas Pay Off

I have been working at my trade a good many years, and have often advanced ideas that have been used and approved. But your check for my Practical Idea is the first practical compensation I have ever received. The fact that it is recognized publicly has given me a greater lift than anything else.

Robert N. Parkes
Wickliffe, Ohio

Inspection Beef

I have read your article on inspection tools (*AM*, Nov 12) with much interest, but would like to point out that there are still a great many inspection tools — or should I say instruments — which have not been mentioned in it.

For instance, there is no mention of the gages used for checking the thickness of plated and painted coatings, and there is nothing on supermicrometers or "millionth" measuring machines. Nor is there any mention of electronic sorting machines which automatically gage and sort small parts.

I also notice that you refer several times to the three-wire system of measuring threads, but you do not explain what this is. And you have omitted the very important optical flats. I don't want to appear too critical, but these are only a few of the many important instruments not mentioned.

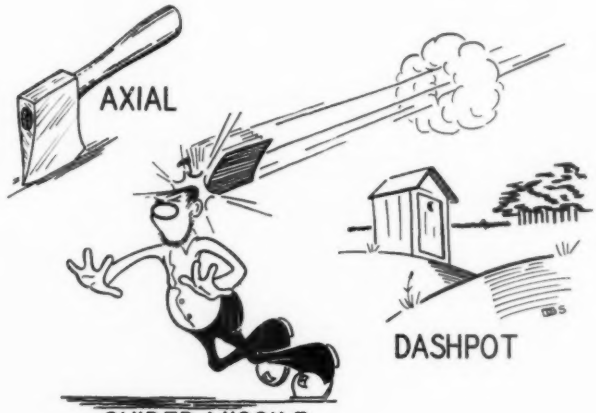
When an article is supposed to tell everything about inspection, I think it should do just that, and not do only half a job.

J. Robert Hunniker
Providence, R. I.

We are afraid reader Hunniker has misunderstood the purpose of this Special Report. To attempt to describe every existing piece of inspection equipment, and how to use it, would require a volume of some considerable size. The avowed purpose of the article, as explained in the foreword, was to familiarize the beginner with the equipment he is most likely to encounter in his daily work. Special gaging machines and gage laboratory equipment are outside the scope of the report.—Ed.

GRINETICS

BY D. G. SMITH



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Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

150,000 Stainless Spoons from Striking Dies of XX Carbon

The shaping of stainless steel can be a tricky job. A leading cutlery maker, faced with new problems in starting the production of stainless flatware, asked Bethlehem to recommend a tool steel suitable for striking dies. (The master dies are hand-engraved by craftsmen in the traditional fashion of this intricate art.)

The manufacturer adopted our recommendation of Bethlehem XX Carbon Tool Steel for this difficult operation. Results have been highly satisfactory. Spoons and other flatware are struck in quantities exceeding 150,000 pieces from one impression of the striking dies.

XX Carbon Tool Steel offers many advantages for general-purpose tools and dies. It's easy to machine and heat-treat: it develops a hard case, reinforced by a tough, shock-resisting core; it holds a keen cutting edge; it's economical; and there's a range of carbon content to meet many different requirements.

We closely control the hardenability of this grade, and give it a careful and uniform spheroidize-anneal. Bethlehem Carbon Tool Steels are the kind you can rely on for top performance.

Our Tool Steel Engineer Says:

Use thermocouple when you pack-harden tools

Whenever tools are pack-hardened (to reduce the scaling and decarburization) place a thermocouple *in the pack* against the tools so that the time the *tools* are at heat can be determined accurately.

Recently a 34-in.-diameter die ring of our Lehigh H (high-carbon, high-chromium) Tool Steel was pack-hardened by an experienced heat-treater. Treatment completed, he checked the hardness and was flabbergasted to find that he had obtained a hardness of only Rockwell C-48. Then he checked his pyrometer charts which proved, he thought, that he had followed the recommended heating cycle. Why the low hardness?

A Bethlehem trouble-shooter suggested that he insert a thermocouple in the pack against the ring. He did so, and this time got a hardness of Rockwell C-60—proving that in the first treatment the die ring wasn't heated long enough to reach the proper temperature, even though the records of the furnace heating cycle appeared to indicate correct treatment.

BIG DIE OF A-H5 MAKES CAR PARTS

A massive die produces spring plates from 3/16-in. steel plate for hopper cars, at the Berwick, Pa., plant of American Car & Foundry. All wearing surfaces of the die, which performs a punching, blanking, and forming operation, are made of A-H5 Tool Steel.

This leading car-builder uses this 5-pct-chromium, air-hardening tool steel to produce car parts from carbon steel, low-alloy high-tensile steel, and aluminum. A.C.F.'s experience with A-H5 confirms its good machinability, its high resistance to wear and distortion, and its sharp, durable cutting edges.

Here's a general-purpose, air-hardening grade of steel that's hard to beat when safer hardening and high wear-resistance are of special importance.

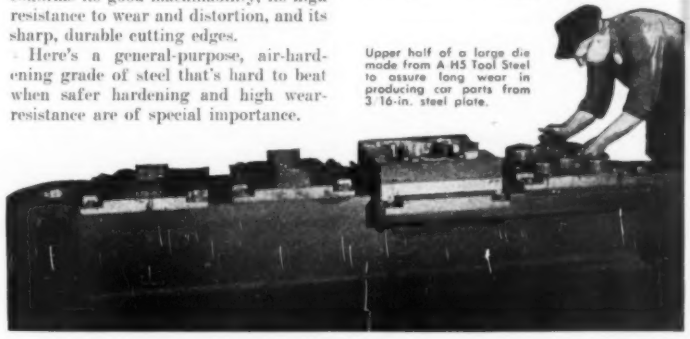
Prompt shipment to our distributors is made possible by our modern tool-steel depot at Bethlehem, Pa. Complete sizes of 23 different grades are stocked.

Tool Steel Distributors Give Service in a Hurry

Delivering tool steel in a hurry is only one of the many services performed by the distributor. He knows local requirements, and he carries large stocks of the tool steel grades and sizes that his customers are most likely to require. He's ready at any time to go into action to see that your tool steel needs are taken care of, whether it means cutting bars to exact size or lending a hand in recommending the kind of heat-treatment you'll need.

Having a tool-steel distributor in your neighborhood makes it unnecessary for you to carry large inventories of tool steel . . . and he often carries other steel specialties that you use frequently.

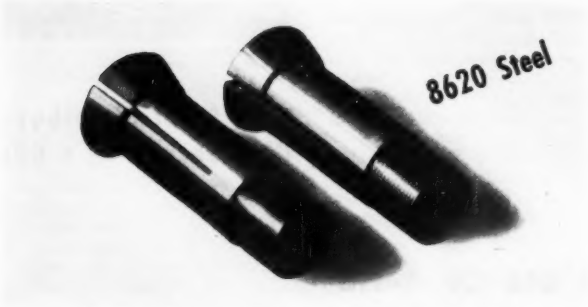
Distributors of Bethlehem Tool Steels are reputable, experienced firms. They render a real service in all parts of the country. We are proud to have them so closely linked with our sales organization.



Upper half of a large die made from A H5 Tool Steel to assure long wear in producing car parts from 3/16-in. steel plate.

Bethlehem ULTRASONIC TESTED **Tool Steel**

Licks those TOUGH THREADING JOBS too!



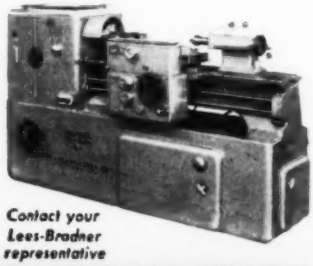
1" Dia. — 20P — RH — 1200 RPM Single Thread — Tool Kennametal K4H

COLLET THREADED in 35 SECONDS

with Cri-Dan Single Point Method!

BATTING OUT TOUGH THREADING JOBS in record time is a commonplace, everyday chore with Single Point threading on the Cri-Dan High Speed Threading Machine, as the threading time figures on the above collets prove.

No other threading method comes even close to the speed, economy and versatility obtainable with the Cri-Dan . . . you achieve unbelievably high production at extremely low tool cost. Thread profile can be readily modified if desired . . . 15 minute changeover assures wide versatility.



Contact your Lees-Bradner representative

The LEES-BRADNER Company
CLEVELAND 11, OHIO, U.S.A.

Is Our Face Red?

Apparently you belong to that school of thought which believes that, if one times nothing is nothing, twice nothing must be something. Otherwise, I fail to see how you can reduce rejections, or anything else, 7600%. (*AM*, Nov. 26, p. 150) When something has been reduced 100%, that's all there is, there isn't any more.

You want to watch out for those percentages; they'll trip you up if you don't watch them. If you increase something 100%, you double it, but if you reduce it 100%, you don't halve it, you wipe it out altogether.

No doubt you know this as well as I do, and have just fallen into an old schoolteacher's trap by converting 76 times into 7600%. Actually, the percentage reduction, from 40 to 0.52%, would be 98.7.

H. J. Packer
New York City

Percentages seem to be everyone's weak spot—including ours, so we are extra careful about 'em. But this was a last-minute on-page change of headline—from "76 times" to "7600%" —and it went through in the absence of our usual percentage watchers (self-appointed to the task because they've made the same mistake themselves—once). They caught one just a few days before, in which an author said "350% better" when he meant only 350% of the original—or 250% better—because "better" means you have to take out the original amount for true comparison. Thus a speed of 350 sfpm is 350% of a speed of 100 sfpm, but only 250% better—and decreases cycle time only 71.4%.—Ed.

Oh Canada!

I notice you have published several articles recently concerning manufacturing plants in Canada. I should be most interested to learn what opportunities there may be for skilled machinists. Are there any restrictions on Americans working there? Would I have to learn French? What sort of wages do they pay?

Leo J. Lewis
Atlanta, Ga.

There is a great demand for skilled labor, and there are unlimited op-

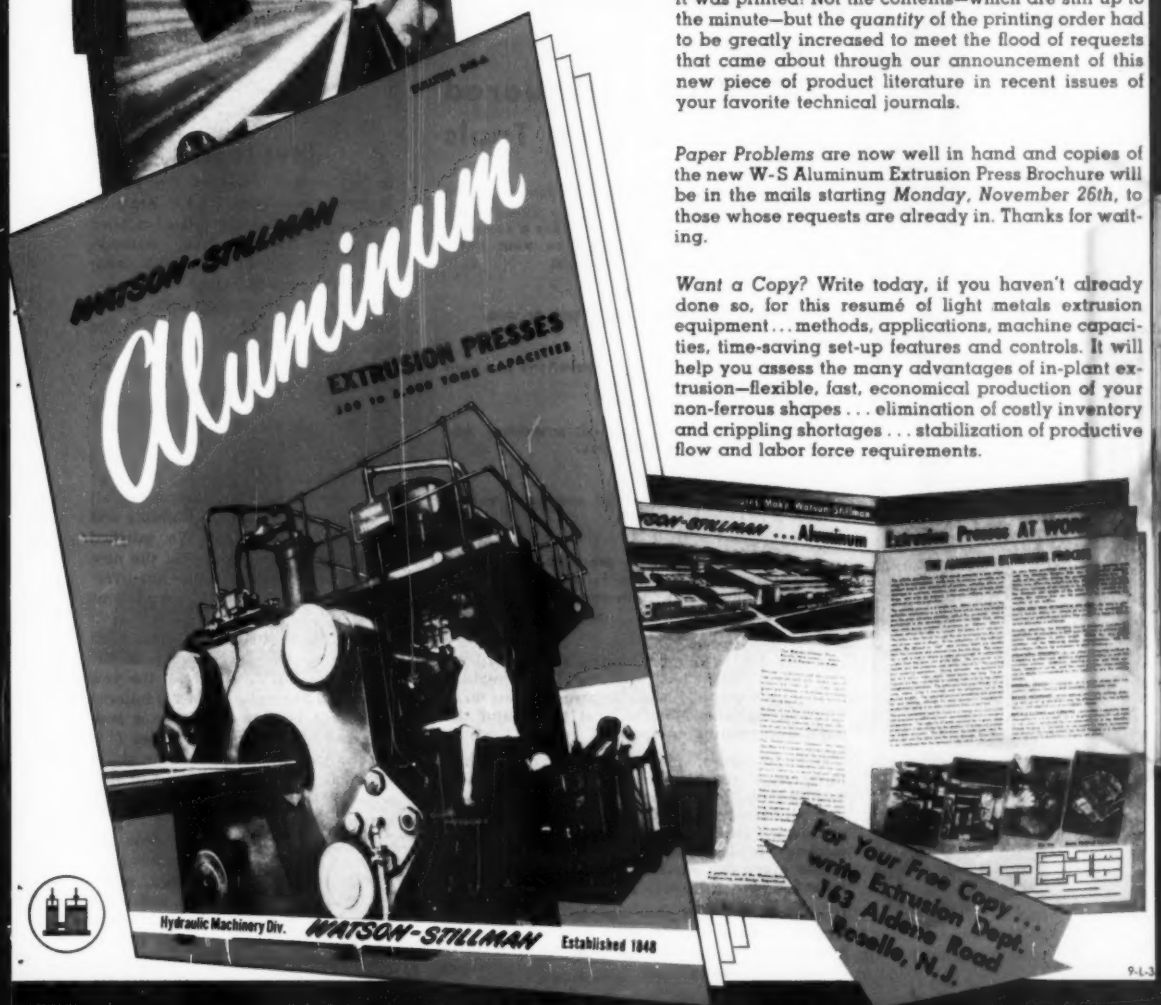
Revised . . .

and Ready–for you

Here's a fact-packed Bulletin that was revised *before* it was printed! Not the contents—which are still up to the minute—but the *quantity* of the printing order had to be greatly increased to meet the flood of requests that came about through our announcement of this new piece of product literature in recent issues of your favorite technical journals.

Paper Problems are now well in hand and copies of the new W-S Aluminum Extrusion Press Brochure will be in the mails starting *Monday, November 26th,* to those whose requests are already in. Thanks for waiting.

Want a Copy? Write today, if you haven't already done so, for this resumé of light metals extrusion equipment . . . methods, applications, machine capacities, time-saving set-up features and controls. It will help you assess the many advantages of in-plant extrusion—flexible, fast, economical production of your non-ferrous shapes . . . elimination of costly inventory and crippling shortages . . . stabilization of productive flow and labor force requirements.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Aluminum
EXTRUSION PRESSES
Hydraulic Machinery Div. WATSON-STILLMAN Established 1848
For Your Free Copy . . . write Extrusion Dept. 163 Alden Road Roselle, N.J.

9-L-3

HYDRAULIC MACHINERY DIVISION **WATSON-STILLMAN** ESTABLISHED 1848

Factory and Main Office: Roselle, New Jersey

Branch Office: 228 N. LaSalle, Chicago, Ill. • Manufactured in Canada by—Canadian-Vickers, Ltd., Montreal

REPRESENTATIVES

Akron, Ohio	Watson-Stillman Co.	Indianapolis 20, Ind.	Millholland Machinery Co.
Birmingham 3, Ala.	George M. Meriwether	Los Angeles 11, Cal.	H. M. Royal, Inc.
Buffalo, N. Y.	Dan W. Patterson Co.	Pittsburgh 19, Pa.	Stanley Berg & Co.
Dallas, Texas	M & R Sales Co.	Portland, Ore.	Machinery & Tool Supply Co.
Denver 2, Colo.	Overgard Machine Tool Co.	San Francisco 7, Cal.	Schellenbach Mach. Tool Co.
		Seattle, Wash.	Machinery & Tool Supply Co.
		Spokane 8, Wash.	Machinery & Tool Supply Co.
		St. Paul 4, Minn.	Anderson Machine Tool Co.

Turn problems into profits
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GORHAM-Engineered
Special Cutting Tools
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BD = √(BE)² + (DE)²
For fast, practical solutions to tough tooling problems, call in the expert . . . your nearby Gorham Field Engineer! He provides a complete engineering service to determine your exact tooling requirements. For instance:
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He starts with your product, sketch or idea.
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He considers work material properties and desired finishes and tolerances.
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He plots proper machine feed, speed and method of tool driving.
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then . . . he develops practical design and engineering specifications for a special cutting tool, metallurgically "tailor-made" for your application.
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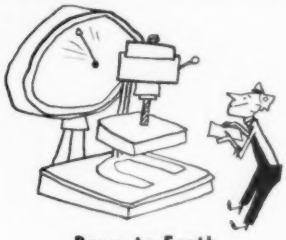
. . . and his recommendations are backed by Gorham's unmatched facilities! These include three fully-equipped manufacturing plants, large Engineering and Metallurgical staffs, and the finest heat treating equipment.
These resources, plus Gorham's more than thirty years' reputation for producing the finest cutting tools, are dedicated to furnishing prompt and profitable solutions to your special tooling problems. Gorham-engineered "specials" are turning problems into profits in thousands of plants every day . . . why not let them do the same for you?
If you haven't met your nearby Gorham field Engineer, write for his name, or send details of your problem direct for recommendations.
Gorham TOOL COMPANY
"EVERYTHING IN STANDARD AND SPECIAL CUTTING TOOLS"
14408 WOODROW WILSON • DETROIT 3, MICHIGAN

portunities. A knowledge of French is not necessary, although it might be useful in Quebec province. Wages are generally lower than in the U.S., but living costs are lower, too. As far as we know, there are no restrictions on Americans working, but would suggest writing to the Canadian Information Office, 620 Fifth Ave., New York City, where complete information can be obtained.—ED. . .



Down to Earth

In his article "Beefed Up Floors Support New Tools," (*AM* Sept. 3) your contributor has missed a very important consideration, namely; How much weight will the foundations and subsoil carry?

If the soil loading of many buildings were doubled, as it was in the case of the Riverside Metals Co., many buildings would simply topple over into the river.

W. P. H. Hatty
Welwyn Garden City, England

We would like to point out that one of the first steps our engineer took was to study the carrying of all loads down through the building and into the foundations. We satisfied ourselves at the outset that the new machinery would not cause any overloading of the existing foundations or soil.

The real problem that confronted us was on the fourth floor of the building. That involved not the new total load to be placed on the foundations, but how to distribute a sudden new load in one small area (the fourth floor bay) so no undue strain would occur in the structure at that point. This we accomplished through construction of the grid.

Our engineer, Frank N. Kneas, has been in charge of the structural design of about 400 buildings, many of considerable magnitude, and while our problem had certain unique characteristics, the over-all project was nothing new to him or his staff.

You may be sure we looked the problem over from every side (including "top to bottom") before we moved.

Bernard Blackman
Keystone Watch Case Div.
Riverside Metal Co.

USERS *Recommend Highly*

THE CINCINNATI BICKFORD TOOL CO.

RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

Radials 7½" dia. col., 2½" arm, to 26" dia. col., 12' arm.
General purpose Uprights, 21" to 28" sizes.
Production Uprights, 21" to 28", Jig Borers, Portable Horizontals, Spacing Table Machines.

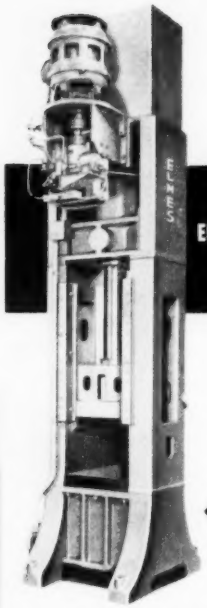
Equal Efficiency of Every Unit Makes the Balanced Machine

We have proven conclusively in our shop that this new SUPER SERVICE Precision Drilling Machine, when used with an automatic spacing table, saves money, time and labor by eliminating jigs, bushings and fixtures. This 36-speed, 18-feed, 10 HP Machine is well recommended. This typical statement was made by a user of one of these new machines:

> "The SUPER SERVICE Precision Drilling Machine is the best investment we have made for a long time. It is performing way beyond our expectations as to drilling time, precision work and overall savings."

Let us show you how your jobs can be economically processed on one of these machines.

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

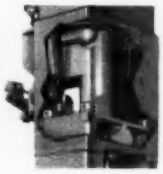


New!
ELMES PIPELESS HYDRAULIC PRESSES

◀ REAR VIEW

Any Elmes Metal-Working Press can be supplied with the new Elmes pipeless construction. Drawing & Forming Press is illustrated here.

FRONT VIEW ▶
(SECTIONAL CUT-AWAY)



Elmes Pipeless Hydraulic Metal-Working Presses employ a revolutionary construction principle. The main hydraulic circuit has no piping. All high-pressure hydraulic fluid is conducted through short, direct passages drilled in the structural parts. As a result, there are no high-pressure screwed joints to loosen, no oil dripping from loosened fittings, and no possibility of welded joints breaking loose. Exceptionally smooth operation virtually eliminates vibration. These advantages make for remarkably low-cost maintenance. Downtime is practically eliminated. Write for Bulletin No. 1011, "Elmes Pipeless Metal-Working Presses".

If It's

METAL WORKING

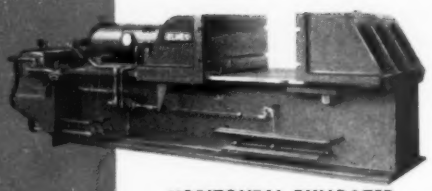
YOU'LL DO IT

better...faster... at lower cost

ON AN

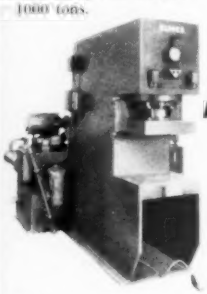
ELMES

hydraulic press



HORIZONTAL BULLDOZER

On heavy bending and forming operations this versatile Elmes Hydraulic Press will save you time and money. No pre-setting or re-setting of press stroke. To change jobs, just change dies. Standard and special designs, in capacities to 1000 tons.



AUTOMATIC OPENSIDE PRESS

This specially designed press accomplishes in a single stroke the shearing, riveting, and straightening of forged steel work of variable thicknesses. Openside presses available in standard and special designs.

HOBBING PRESS

For die-sinking and hobbing — forming duplicate die inserts, multi-cavity molds, and single molds with unusual contours. Capacities to 5000 tons.

WRITE FOR BULLETIN 1010-B

Illustrates, describes, and gives major specifications on Elmes Hydraulic Metal-Working Presses. See your Elmes Distributor — or write to us direct.

American Steel Foundries

ELMES ENGINEERING DIVISION

1161 TENNESSEE AVENUE CINCINNATI 29, OHIO

DISTRIBUTORS IN PRINCIPAL INDUSTRIAL CENTERS —— ALSO MANUFACTURED IN CANADA

METAL-WORKING PRESSES • PLASTIC-MOLDING PRESSES • EXTRUSION PRESSES • PUMPS • ACCUMULATORS • VALVES • ACCESSORIES

SPOT NEWS of Metalworking

- **A prominent automobile maker is trying to schedule orders** with machine-tool builders for a new-model-engine tooling program, claiming that its orders are rated under NPA regulation issued last June 21 to cover steel allotments for new facilities. NPA officials are seeking some way of blocking this project, which tends to nullify the amendment to M-41 forbidding shipment of unrated machine tools after next Feb. 1. For further details and other news about machine tools, turn to page 85.

- **Miracles do happen.** Workers in one metalworking shop west of the Mississippi asked management for permission to operate two machines each instead of one. They didn't have enough to do to keep themselves happy.

Bitter experience of Air Force in Korea has caused one important jet-engine program to be discarded in favor of a brand-new turbo-jet program. Contractor is just starting engineering work prior to placing of orders for production equipment. Advantage of turbo-jet plane: It can be maneuvered successfully at low altitudes as well as high.

- **Grave sheet steel shortage is threatening Australia** following cuts in British exports and refusal of U.S. to supply steel other than for defense production. General Motors is seeking sheet steel in Japan to maintain production of its Holden car but prices are very high.

- **A substitute named "Niklit" may be one way out of nickel-shortage problem** for British auto makers. Developed by Metal Processes Ltd., the process involves use of a chemical solution which is heated in a steel tank by a common gas burner. Articles requiring a good imitation white nickel finish are then immersed in the solution for from 5-10 minutes. No electrical equipment is needed. Niklit is said to change the surface of the metal. It does not turn black. Parts can be chromium-plated later, if required.

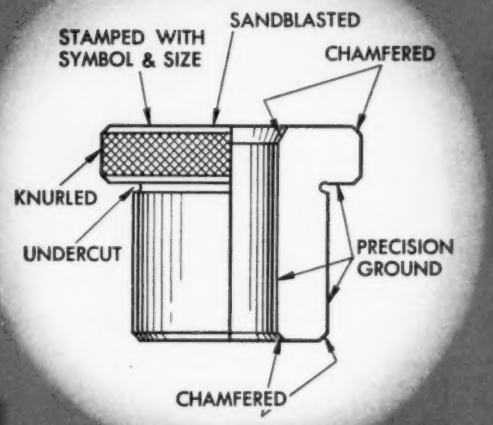
- **New process for inseparably bonding copper to steel** to produce sheets 80% steel and 20% copper has been developed by W. L. Ulmer of Automatic Gasflux Co. and Superior Flux & Mfg. Co., Cleveland. Sheets can be deep drawn or otherwise formed without danger of separation. Around the edge of a thoroughly cleaned steel slab or plate a fence is welded to slightly above height of the copper. The steel is heated to 1000 F, and then treated with a gas flux. Molten copper is poured to the level of the fence, and the plate heated again to 2000 F. The gas flux eliminates oxide between the bonding surfaces when the copper is poured, and in the second heating it provides the microscopic "wet" which insures bonding into a bi-metal.

- **A transfer mechanism to index, advance and unload 22-lb brake drums** through a 600-ton coining press has been developed by Sahlin Engineering Co., Birmingham, Mich. It was designed specially for a leading automotive manufacturer to eliminate danger to the press operator while feeding and unloading. The transfer mechanism can deliver 12 brake drums per minute.

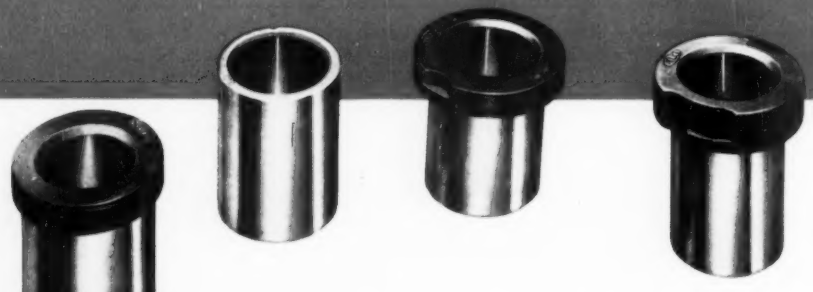
Metallic tungsten can be cut on normal shop machines. A technique developed by Philips Laboratories allows drilling, turning, grinding, threading, and milling in spite of the metal's brittleness. Tolerances so far are as close as 0.0005 in. Practical application is drilling thin electron-tube cathodes.

- **A new polyester laminating resin which will withstand temperatures as high as 500 F** has been developed by Naugatuck Chemical Division, United States Rubber Co. Wright Field is now testing use of the new resin as a structural material in manufacture of high-speed aircraft and guided missiles. Heat resisting properties of the resin are made possible by use of a new chemical, triallyl cyanurate.

- **Maritime Administration unit will soon let contracts** to change the pitch of standard propeller blades by pressing. Principal changes will be made on Liberty vessels where the pitch will be changed from 16½-ft bite to a 19-ft bite. Reason for the change is to alter stresses on tail shaft of Libertys.



THE INSIDE STORY OF EX-CELL-O DRILL JIG BUSHINGS



Here are a few good reasons why Ex-Cell-O Drill Jig Bushings last longer and perform better:

1. Premium grade tool steel is selected for wear resistance and heat treated to 62-64 Rockwell "C".
2. Every bushing must measure up to Ex-Cell-O precision standards, as well as to A.S.A. standards.
3. High finish is ground on inside and outside diameters, and *under the head* for perfect bearing.

Take a tip from the country's largest users of drill jig bushings. Order from the convenient Ex-Cell-O Catalog.

To satisfy the needs of your purchasing and engineering departments be sure to have an adequate supply of Ex-Cell-O Bushing Catalog, Bulletin 35371. Ask for the copies you need.

XLO

EX-CELL-O PRECISION

EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • CUTTING TOOLS
RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT
AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

51-52

Washington

Next big mobilization bottleneck: components. Controls officials say snarls in components supply lines already rank second only to shortage of machine tools as barrier to upping production of many military items.

• • •

It's mostly a distribution problem. Key components simply aren't getting to some military projects—notably aircraft—in time or volume to meet production schedules.

But there's no lag for civilian lines. Controls experts estimate 80% of components output still goes to consumer goods, only 20% to military production, expansion of defense and other vital plants.

• • •

Mobilizers' answer is scheduling of key components—just as WPB did in War II. NPA will take over order boards, refigure production and delivery schedules of makers of aircraft, tank, other military components. Suppliers of atomic energy and steel expansion programs also will come in for rescheduling.

There'll be interim controls on components until scheduling is possible. NPA has set up units to study needed components, help their makers get materials, force them to take defense orders. They'll use persuation, directives, DX orders, wherever necessary.

They'll give "super priorities" to manufacturers who put most—80 to 90%—of their production into defense work. Aircraft-parts makers will get the first of these. They'll use the Air Force's A-1 symbol on their allotments, pass it on for both materials and subcomponents.

Machine-tool builders get a similar deal. Their allotment symbols will rate with the A, B, C and E of the military and atomic-energy programs. Starting with the second quarter, orders bearing these symbols must be accepted by suppliers having open capacity, must be handled ahead others with conflicting delivery dates.

• • •

All this reflects mounting concern over the lag in military production. Mobilization Boss Wilson has ordered drastic steps to get more arms deliveries—particularly aircraft.

So materials controls will tighten. DPA will cut back materials for consumer goods again in the April-June quarter. Rising aircraft production needs account for the big cuts—in copper and aluminum.

Nickel for civilian uses is on the way out. Though not under CMP, it's also allocated because of large military demands, chiefly jet engines. There'll be less and less for radio and TV tubes, electric heating units, etc.

Even the military brass has been jolted. Defense Secretary Lovett's appointment of William D. Pawley as his procurement aide was partly in answer to Congressional criticism. Sen. Lyndon Johnson has been demanding a military procurement czar, a new Gen. Somervell.

Pawley has a real job, though he won't be another Somervell. But he'll have Lovett's backing in speeding up contract letting, firming up specifications, breaking bottlenecks.

• • •

Pay no attention to talk of higher taxes. The President will ask Congress next month for another $10 billion in revenues from new excises, levies on corporate and personal income. But, short of all-out war, Congress is likely to shelve any tax bill in 1952.

• • •

Draft calls are still going up. By March, monthly rate will be above 60,000 men. Reason: Army and Marines are beginning to lose inactive Reservists they called up. They're required to release these Reserves after 17 months.

More reserves also will get active duty. Army will recall 16,000 officers. By summer most reserve officers passed over so far will be back in uniform.

• • •

Enforcement of wage controls is getting under way now that most of the major wage policies have been developed.

First violators to go on trial before the Wage Stabilization Board were two contractors near Detroit who paid above-scale wages to bricklayers.

If the contractors are guilty, all or part of the illegal wages may be disallowed as an expense for income tax purposes or as a cost on government contract. (In extreme cases, criminal prosecution may result.)

• • •

Many violations are turned up by Labor Dept. inspectors checking payrolls for wage-hour law violations. But not all are prosecuted. Minor and unintentional violations are excused if they are corrected. In some, WSB will make an agreed compromise settlement with the employer.

When wages in new plants are set too high, WSB will roll them back to conform to area levels. It lopped 13 cents an hour off the rates Avco Corp. installed in its new jet engine plant at Bridgeport, Conn. Other manufacturers in the area had complained that they were losing workers to Avco and could not compete with Avco in recruiting.

Tandem bearings made

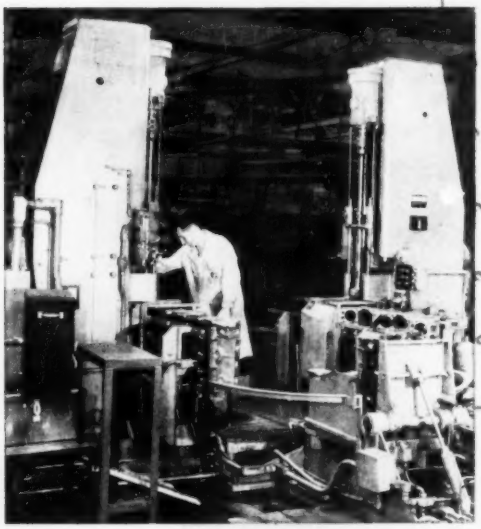
ROUND ★ STRAIGHT ★ IN LINE

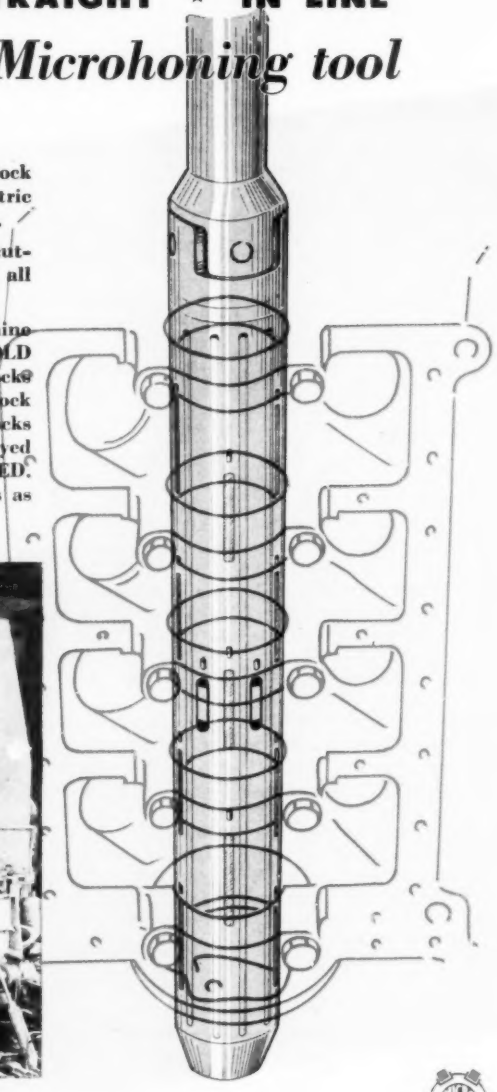
with NEW *Microhoning tool*

ALL FIVE bearings in V-8 cylinder block MICROHONED within .0005" for diametric size, roundness, straightness and alignment.

Plastic guides stabilize tool and control cutting. One bank of abrasives MICROHONE all bores.

This double column Model 740 machine equipped with new guided type MICROMOLD tools MICROHONES Main Bearings in 60 blocks per hour, removing approximately .002" stock from the diameter of each bearing. The blocks are automatically taken from the line, conveyed to either of the columns, and MICROHONED. The operator makes occasional spot checks as the blocks leave the machine.





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Detroit

Automobile companies are far from discouraged about the outlook for retail sales. They regard the present "soft" period as a temporary situation which will end in a month or two. It is a seasonal sag that always hits the industry in the early winter.

Come late winter and early spring, Detroit expects a brisk market for passenger cars. Top officials say that Washington's allotment of 1 million passenger cars for first quarter is at least 10-15% short of the number that can be sold.

• • •

Used car prices are best test of the motor car market, automotive people contend. A two-year-old popular make now is bringing about 75% of the new-car price. Prewar it brought 50-60%. As long as today's high ratio continues, there's nothing fundamentally wrong with the retail car market.

Detroit car companies have no intention of giving up on 1953 models, merely because NPA has ruled that unrated machine tools cannot be delivered after next Feb. 1.

Dodge Div. of Chrysler, Buick and Ford (with its V-eight and Mercury lines) are mainly affected. All of them have new engines in various stages of development and tooling. All of them will do everything within their power to gain the competitive advantage of a new engine.

Chief contention is that machine tools well along toward completion, which can be delivered to auto companies by May 31, should be allowed to go to auto makers. Both machine builders and motor car makers have big investments in them already. NPA probably will give a favorable nod.

• • •

A normal 1953 model changeover, therefore, is closer than it was. Remember, too, that nothing in the order prevents fabrication of dies. You can, therefore, build a new body shell for 1953 if you're so minded. It's unlikely that you'd do so without accompanying changes in underpinning (which would require machine tools) but it's possible.

In other words, 1953 models won't be dead ringers for 1952's, as it appeared a few weeks ago.

• • •

Labor clouds may be darkening in the skilled trades. There was, you remember, a special Wage Stabilization Board panel report on tool and die wages; the majority (public and labor members) recommended procedures which would boost wages. But WSB itself refused to accept the recommendations, did nothing.

There was quick reaction in Detroit. The CIO Auto Workers' skilled trades department and some locals held protest meetings, complained loudly. Then there were some impromptu walkouts for a day at Ford—each shift quit an hour early.

Since then steam has been mounting. There's more talk in union local papers, more indication of action at international headquarters (which means the start of pressures on Washington) to comply with this rank-and-file restiveness.

The rumblings are duplicated among the production people. At Ford, where there are complaints against work transfers (not much justified right now), the always-turbulent local is crying for 30-hour-work-weeks at 40-hour pay. Ditto at Flint, where there are substantial GM layoffs. Ditto at Dodge local.

Does this go anywhere? It could—if the layoffs continue a long time. That's why Walter Reuther is standing side by side with the auto executives in Washington, calling for special allocations of materials to ward off conversion unemployment. With Reuther on autodom's side, the companies might make a dent in their Capitol opposition, too.

• • •

Politics is coming to the aid of the automobile industry and its allocations. Union complaints against rising unemployment got to Michigan's Governor Williams and Senator Moody; they began immediate protests in Washington against further steel cuts which would enlarge the total of jobless.

• • •

Hudson will introduce a new light car next summer. It is being largely tooled in the company's own shops, and presumably will use a powerplant already in the company lines, or a variation of one rather than a brand new one.

The car will be full size, in step-down design. Its price will be "several hundred dollars" less than the current cheapest car of Hudson.

• • •

The 1952 Chryslers, introduced in mid-December, are face lifted from the 1951's. The primary difference is that numerous body types—those in minor demand—have been eliminated from the line so as to effectuate manufacturing economies with the limited production possible. However, there still remain 18 body styles, one of the widest selections of any company.

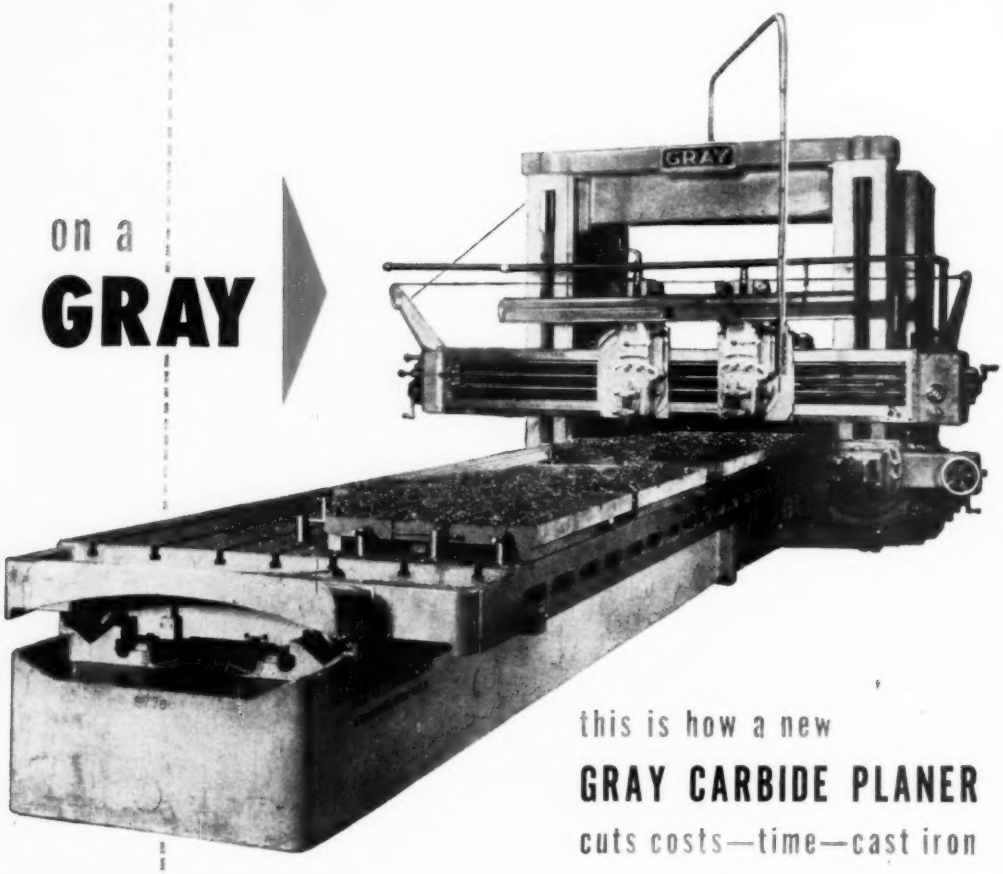
Hydraguide power steering, introduced last year on the 8-cylinder lines, will also be available in 1952 on the sixes.

• • •

Some additional tooling may be in store for the Cleveland Cadillac plant, making Walker Bulldog tanks. Production is due to be stepped up about 60%, to a new total requirement of about $750 million. Most of the enlargement will be taken up by increased second and third shift production.

BIG CARBIDE PLANING PROFITS

on a
GRAY



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Machine Tools

A major automobile company has taken upon itself the responsibility of giving its new engine tooling program a DO rating, without consulting the Metalworking Equipment Division of the National Production Authority.

What's more, it is on firm ground technically. It has dug into an NPA regulation of June 21, 1951, which pertains to CMP quotas for new plant facilities. This allotment of materials, on a rated basis, carries with it automatically a rating to get the production equipment to put into the new facility.

• • •

On this basis, the company's representatives have visited or phoned certain machine tool builders and asked them to take orders for its engine program off the shelf and give it a satisfactory delivery date.

The company's action was received in NPA with surprise and some consternation. It obviously tends to nullify the effect of the amendment to M-41 putting a halt to shipment of unrated machine tools after next Feb. 1.

• • •

NPA's top crust has gone to work to see what can be done to stop this tooling program.

The fact is that NPA already has turned down some so-called "hardship" cases arising out of the M-41 amendment.

• • •

The truth is that NPA is taking a reasonable attitude toward enforcement of the amendment. In general, a machine tool builder who will have a machine at least 70% completed by Feb. 1, and who can finish the machine and ship it by May 1 or earlier, will be allowed to do so.

• • •

Certain automotive engine programs still are in doubt — Dodge, Buick, Ford, Mercury.

All would like to be permitted to set up pilot lines. But the automobile makers stretch a point in using the term "pilot line." None calls for less production than 30-40 engines an hour. And one specifies a pilot line of at least 100 units an hour.

• • •

NPA is reported in the process of rescheduling deliveries of machine tools for defense projects on a realistic basis.

For one thing, all jet-engine programs up to now have had the same standing so far as urgency goes. From here on, intention is to pick out the most-needed program and tool it first. Then complete the second most urgent program, and so on, until all six are fully tooled.

• • •

The Air Force will get jet engines much sooner this way than if all programs are treated alike and are completed at about the same time.

But apart from that, each single defense tooling project and the delivery schedules set up are being minutely examined."

It isn't regarded as sensible to ask the same deliveries on 150 machines, let us say. They should be delivered progressively.

NPA's rescheduling program has exactly that idea in mind. And it is bound to result in considerable reshuffling of machine tool builders' order boards.

• • •

Pentagon still is displaying a complete lack of enthusiasm about a preferential rating system on defense projects. If left to itself, it would keep all programs on an equal footing. But NPA chiefs have forced the military's hand.

There is said to be a "freeze" on diversions of machine tools during the period of reappraisal of delivery schedules.

• • •

The British and French will come off better than some had expected in their efforts to get U.S. machine tools for their defense programs pushed up to closer delivery dates.

Around 350-400 machines for the British, and some 300-350 for the French, have been earmarked for speeded-up deliveries. It is reasonable to believe that at least some of these machines will come out of the U.S. armed services 70% monthly quota.

• • •

About 6400 U.S. machine tools are yet to be delivered to the United Kingdom and France. Of that number, approximately 1000 are for France.

The British have taken delivery of well over 1000 machines. They were helped by the fact that they came into the market very early and got delivery of a sizable number of tools within a few months.

While it is true that the British have cut back their tool orders here by 1000 machines, they have been sending over supplemental lists of new orders from time to time.

The newest list adds to the total of so-called T-lathes to be bought in this country for the British jet engine program.

• • •

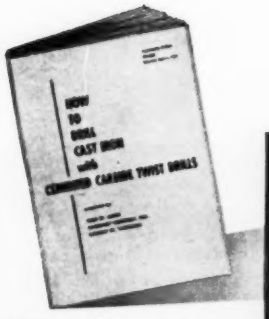
No one is sure of how far along the ordering of machine tools has gone in relation to the requirements for the entire defense program.

Washington is inclined to believe that one-half the machines have yet to be ordered.

But some big defense contractors (and many tool builders) look upon that figure as high.

They feel that there is considerable "water" in present orders. But the point is that no one really knows for sure.

How to get production UP



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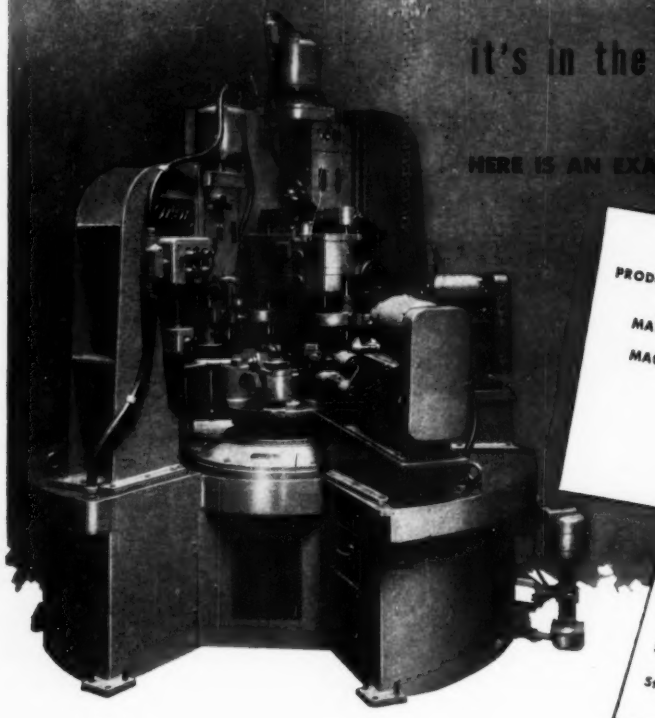
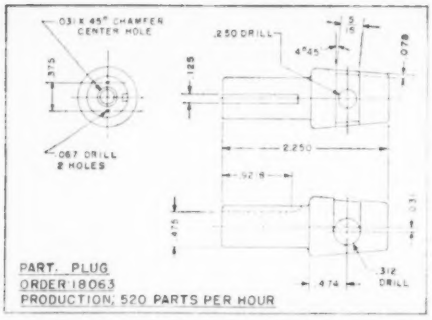


PART	Control Plug for Gas Stove.
PRODUCTION	520 Parts Per Hour at 100% Efficiency.
MATERIAL	Aluminum.
MACHINE	S. O. No. 18063—Consists of five No. 1 Avey Automatic Cam Feed Units, mounted at suitable angles around one 20" Avey Automatic Index Table. All Units arranged on one fabricated steel base which contained suitable coolant system and chip disposal.

SEQUENCE OF OPERATION

Station 1	Load and unload by quick-acting crank type fixture.
Station 2	Mill .125 slot.
Station 3	Drill one vertical .057 hole and one horizontal .250 hole.
Station 4	Drill one .057 hole and one 5/16" hole.
Station 5	Chamfer 3/16" and mill slot between the two .250 holes.



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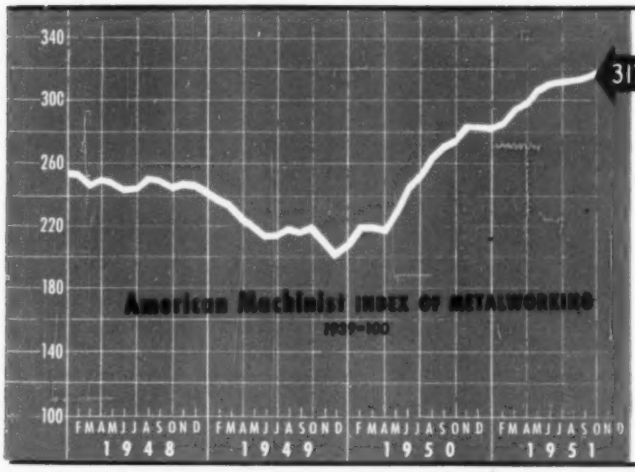
Gaging Metalworking


340
300
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180
140
100
317
American Machinist INDEX OF METALWORKING
1939=100
F M A M J J A S O N D F M A M J J A S O N D F M A M J J A S O N D F M A M J J A S O N D
1948
1949
1950
1951

INDEX

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	NOV '51	OCT '51(p)	SEPT '51(r)	OCT '50
	317*	314	313	285
Machinery		306	302	261
Electrical Manufacturing		351	345	333
Automobiles, Trucks		219	224	264
Transportation Equipment		440	457	273
Other Metalworking		308	308	308

* Estimated (p) Preliminary (r) Revised

Metalworking production should creep upward the next month. Its progress will be less swift than anticipated, because defense work is behind schedule.

• • •

Pentagon is changing its mind frequently about what kinds of weapons it wants. It is hesitant about committing itself to armament orders of sizable volume for any single item.

Defense contractors, as a result, often don't know where they stand. And their uncertainty is passed down to their subcontractors.

Some big companies admit that they are creating tooled-up facilities, but up to now they are very short on orders for the end-products to be manufactured in those facilities.

• • •

The first quarter looks a bit grim to many civilian goods makers. By comparison with conditions the past two years, that is.

Passenger car companies are fretting over their low quota—roughly 1-million units—for the January-March period. They claim that this figure is 10-15% less than it should be.

Refrigerator people are up against the hard fact that dealers' stocks are double the normal size. And TV and radio set sales are scarcely lively. The situation does not cause manufacturers to cheer about the first quarter outlook.

There are some plus factors, of course. Producers of various kinds of durable goods with defense ratings are straining to expand output. The aircraft industry is adding to its shipments and parts processing as work forces are enlarged at existing plants and as new facilities come in.

Carbon steels have eased notably. That is especially true of sheet and strip. But steel plate, structurals and alloy steels are another story.

Far fewer conversion deals are on. And you hear much less about foreign steel.

Copper is responsible for the real pinch with many metal shops, particularly the automotive industry.

• • •

Employment scramble isn't likely to be as severe as expected, except in a limited number of critical areas.

The big problem in the first quarter will be how to keep people at work, as the critical changeover period gets closer at hand.

• • •

Here is what's happening on the West Coast: Civilian output at Los Angeles is down to 75% of the pre-allocation level. Defense work has made up the difference in large part.

But a growing number of small companies are skimming along the break-even line. They are trying for defense subcontracts. However, there just aren't enough to go round, despite Southern California's position as a major aircraft center. Best off are companies which had been subcontracting civilian work for firms now loaded with defense contracts.

• • •

Cuts of about 10% in production have been made in San Francisco Bay area, as metalworking companies begin to shift over to defense operations.

Little actual defense work is under way at San Francisco. Yet demand for skilled help is as great as ever, with almost no unemployment.

Gaging Business

Industrial production is up about 2% compared with a year ago. Machinery output shows the most spectacular rise: 19%.

Wholesale prices have gone up 3% in the same time. There is a big fluctuation in various lines, however. Food prices have increased 8%, but textile prices are down 5%.

Retail stores sales are 5% above the year-ago mark. Keep in mind that almost any item which is lower than it was last year has come down from a very high level.

• • •

The inventory situation differs with the kind of person you talk to. Retail inventories have shaken down in recent months. But wholesale inventories are higher than they were.

Manufacturers' inventories are hard to get at. On the whole, they are lower than they were at mid-year. But they still are high.

• • •

Average weekly earnings in manufacturing in October were 28 cents lower than in September. In durable-goods industries the average weekly pay-check was the same for October and September.

Highest weekly earnings in Metalworking in September were $91.25 — for workers in machine-tool accessories.

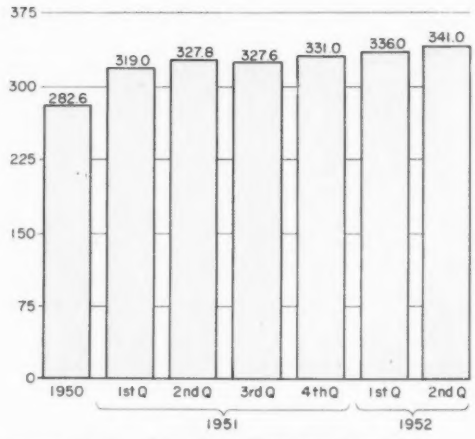
• • •

Radio output fell off in October from the September level. But the ten months total for 1951 was only 9% below the like 1950 period.

• • •

Sales invoiced by National Tool & Die Manufacturers' Association member for October totaled 15% higher than for September and 46% more than for October 1950. For the ten months of 1951, shipments were 63% ahead of the same period last year.

October new orders were about 10% ahead of those received in September, giving most shops now a backlog of from four to five months, compared to a normal six to eight weeks.



Gross National Product Will Climb in '52

But that backlog doesn't reflect true conditions. The heavy backlog is coupled with shortage of skilled workmen. Tool and die shop owners, therefore, are being quite selective in new orders booked. This results in their turning down as many new orders as they accept.

About 5.2-million workers are currently doing defense work. Earlier manpower requirements for an additional 4.5 million defense workers appear too high.

• • •

Output of steel ingots and castings topped the 100-million mark recently. Total production for the year should be nearly 105 million tons. Steel shipments in first ten months of '51 were 11% over the same period last year.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1923-1925 = 100)*	237.2	237.5	225.9
Steel ingot operation (thousands of tons)	2,081	2,063	1,927
Electric power output (million kilowatt hours)	7,444	6,445	5,921
Production of automobiles and trucks	117,693	119,962	162,757
Engineering construction awards (*Engineering News-Record*, millions)	192.5	324.1	136.5

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Refrigerators, sales (thousands of units)	209	215	420
Vacuum cleaners sales (thousands of units)	259	210	331
Washers sales (thousands of units)	304	319	440
Household electric ranges sales (thousands of units)	110	96	135
Television production (thousands of units)	411	337	838
Radio production (thousands of units)	873	1,100	1,230
Gear sales index (1935-1939 = 100)	703.4	630.1	564.8
Foundry equipment new orders index (shipments 1937-1939 = 100)	372.4	346.5	526.8

* Seasonally adjusted

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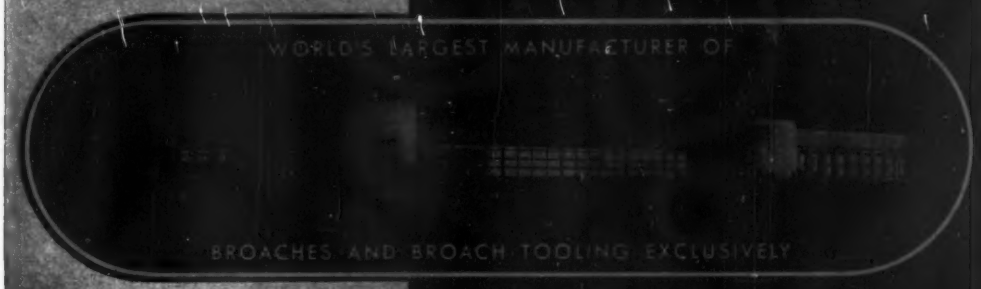

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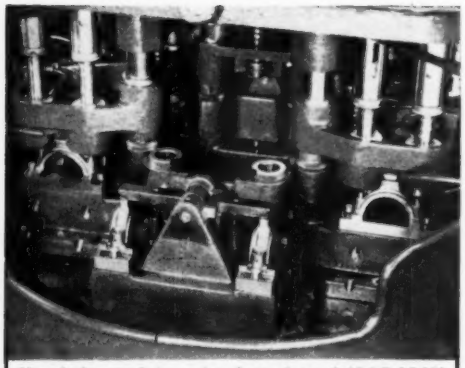

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MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Timetable of Delays

Is Senator Lyndon Johnson's Subcommittee right in its scathing criticism of the defense production program? If we are far behind where we should be, what caused the lag? Suppose we try to get at the facts and see what happened:

After the invasion of South Korea, people rushed to buy automobiles, refrigerators, TV sets, and a thousand other items in anticipation of a shortage. Makers of civilian goods rushed in orders for machine tools and other capital goods.

NO EFFORT WAS MADE meanwhile, beyond peanut size, to mobilize for defense production. The National Production Authority was created, to be sure, but it was subordinated to the Department of Commerce, whose civil-service employees manned it for months. And most of its personnel was stuck away in a corner of temporary T building in Washington.

Phantom orders for machine tools were not activated. No more standing was given to those responsible for manufacturing defense tooling than to makers of pots and pans. And it was not until the start of this year that the military had any idea of what weapons it might want, and Washington agencies were set up to begin to administer the semblance of an adequate program.

BEAR IN MIND, too, that there was no necessity for going all-out for guns as against butter. Unless and until we got caught in an all-out war, we (and the military least of all) did not wish to pour out of our factories thousands of tanks and planes which soon would be obsolete. Crippling our civilian economy in order to produce out of date armament is just what Uncle Joe would be happy to have us do.

Tooling orders didn't begin to materialize until six months or more after Korea. Meanwhile the British had slyly watched what was going on and had come into our machine-tool market with huge orders for their own defense program, beating the Pentagon to it.

On top of these delays, the key defense administrators, and the price people in particular, refused to face the facts of life. They put on a perfect act of slow motion (or standing still), in providing aid to the machine-tool industry.

IT TOOK INCREDIBLY LONG (until July 10, 1951) to get a directive ordering defense agencies to give top help to machine-tool builders. And then it took until early December to get this directive fully acted upon.

It is obvious, in view of this recital, that defense production is not as far along as it could have been if there had been less dilly-dallying in Washington. The military has been at fault, too. It has never come up with a satisfactory bill of particulars as to what it really wants. That goes all the way from machine tools to armament itself.

But, apart from all of these considerations, nothing said or done now can change the fact that it takes time to tool for defense production. You cannot telescope into a few months the building of new complicated machines, with the necessary tools, dies, jigs, and fixtures, for entire production lines being set up from scratch. It will take until late 1952 or early 1953 to get going in a big way. Until then, metalworking plants of this country will not be able to chew up all the steel and other materials made available to them for defense operations by the cutbacks Washington has decreed in civilian goods.

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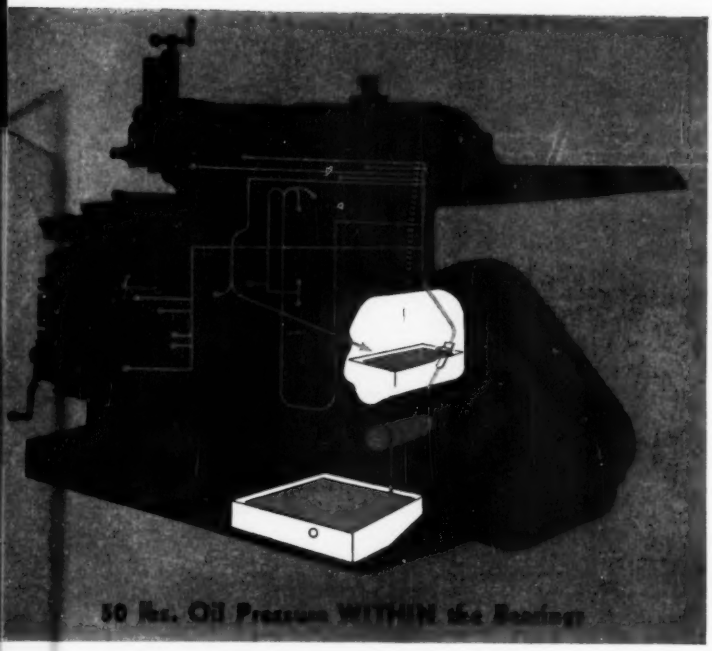
50 lbs. Oil Pressure

maintained in running bearing surfaces



For the first time in the shaper field, bearings on a shaper operate under a positive 50 lbs. oil pressure within the bearings.

Even the most inaccessible bearings of the Cincinnati rocker arm and crank block assemblies operate under a positive pressure oil supply. For the first time, inefficient lubrication by dripping or spraying oil on these bearing surfaces is replaced by full pressure lubrication.

Wear and friction are reduced to a minimum giving Cincinnati Shapers extra years of maintained accuracy and maximum power at the cutting tool.

The system is fully automatic, saves the operator time and is insurance against oiling failures.

Write for Catalog N-5, fully describing these versatile, powerful and productive Cincinnati Shapers.

Other exclusive features . . .

1. Cincinnati Electro-Magnetic Clutch
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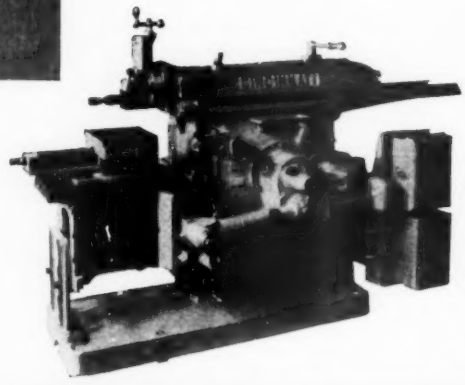
3. Cincinnati Single Adjustment Tapered Gibs.
4. Cincinnati Extended Solid Ram Bearings
5. Cincinnati Dovetail Crank Block and One-piece Crank Gear.
6. Cincinnati Protected Table Support.



THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

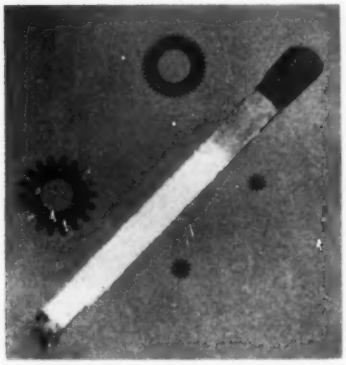
CINCINNATI

Hard to see without a powerful glass, these tiny gears are commonplace in the watch and precision-instrument industries. Upper gear has 11 teeth, 180 pitch; lower one 12 teeth, 180 pitch. Material is half-hard brass, and tooth form is special clock-type. Length of tooth is 0.010 in. Gears are hobbed in groups of 30, and time is 30 sec per group, or ½ sec per piece

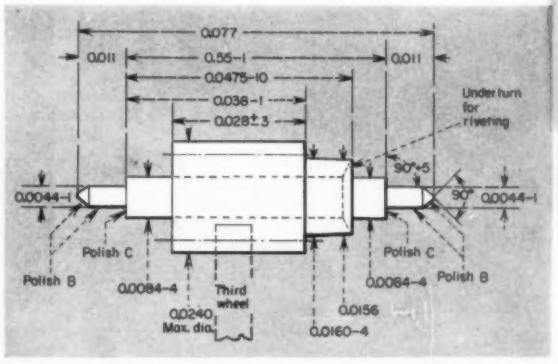
HOW TO CUT YOUR BABY TEETH

Miniature gears and pinions used in the watch and precision-instrument industries require special equipment and techniques ... Barber-Colman, Hamilton Tool, Hamilton Watch, and Pioneer Instrument contributed these pictures to show some of the more important steps in manufacture

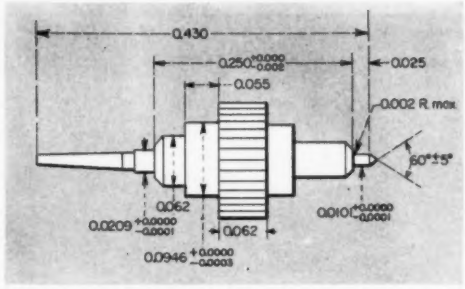
BY H. E. LINSLEY, ASSOCIATE EDITOR



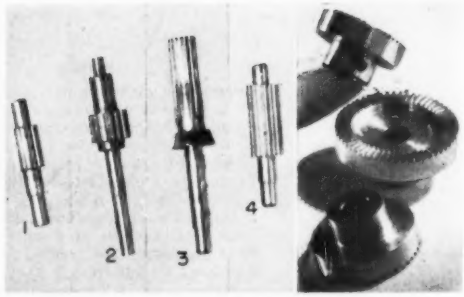
Comparison with an ordinary paper match gives a good idea of relative size. Teeth may be standard involute, epicycloidal, or of special clock shape. Limits rarely exceed one or two tenths, so ground hobs are generally used. Hobs must be kept sharp to avoid burrs, because finishing or deburring operations are impracticable



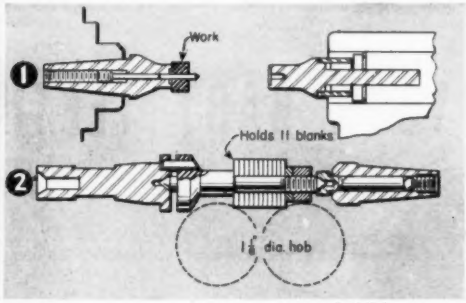
Steel pinion for wrist watch. Correct impression as to size can be obtained by realizing that the ends of the pivot are only 0.0044 in. in dia. Note that when dimensions are in four figures, tolerance is in tenths; when in three figures, tolerances are in thousandths. Pivot is pressed into hole in pinion at assembly



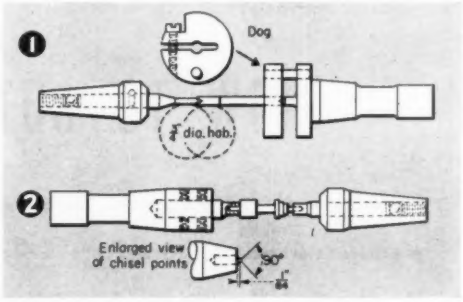
One-piece steel pinion for aircraft instrument has 26 teeth, 200 pitch. Teeth are hobbed in two operations, the finishing cut being taken on the return stroke at half the roughing speed. Hob teeth are ground to a high polish to prevent chips from sticking to the face, loading the gashes, and inducing premature dulling



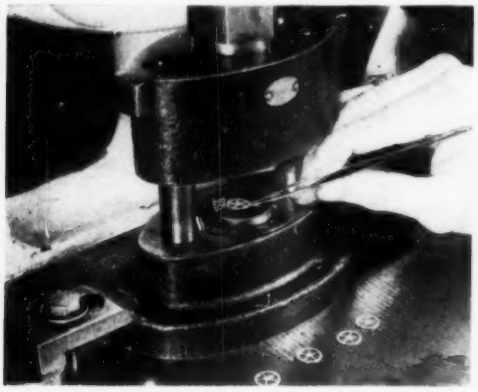
Typical steel pinions produced one at a time. No. 1 has 15 teeth, 180 pitch, and time is 27 sec. No 2 has 10 teeth, 85 pitch, and requires 7 sec. No. 3 has 14 teeth, 180 pitch, and time is 25 sec. No. 4 has 20 teeth, 180 pitch, and time is 44 sec. Crown gears shown are hobbed on a different model machine



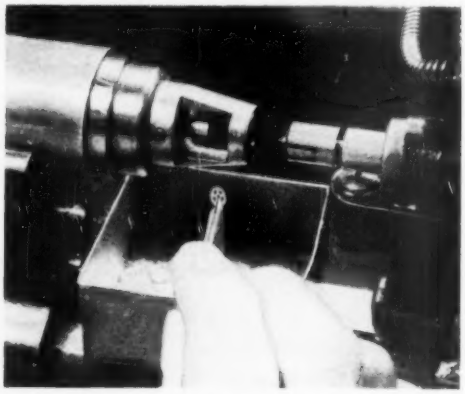
Work-holding fixtures take many forms. No. 1 has a plain mandrel, and pressure on end faces prevents free rotation. No. 2 has a nut and washer to clamp parts on mandrel held between female centers. Mandrel incorporates integral driving dog



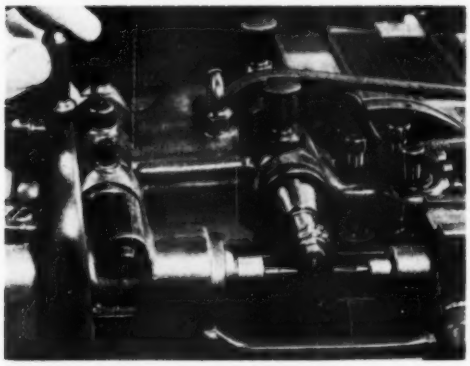
Work-holding fixture No. 1, for shaft with centered ends, has regular 60° centers, and work is driven by a split dog clamped by a setscrew. No. 2 has female centers, and drives by two chisel-edge prongs on head center. Tail center is free to rotate in holder



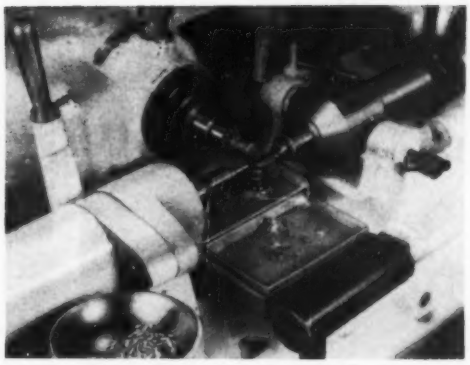
Spoke-type wheels (watchmaker's term for gears) are blanked out, then flattened in a simple die. This is particularly important, because the blanks are stacked for hobbing, and any distortion will produce irregularly shaped teeth



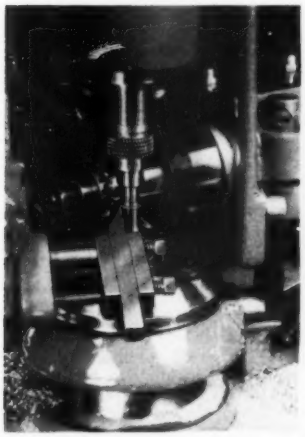
Horizontal drill for pivot hole. Work is placed on the nose of the ram (left) through the opening, and is located by the space between the spokes. This insures concentricity of hole and teeth. Ram clamps the work against the end stop as drill (right) advances



Milling-cutter setup employed when pivots are extremely fragile and the work must be held between centers. Front cutter makes the roughing cut, then the head advances and the rear cutter makes the finishing cut. One operator runs six machines. Time is about 1½ min, and scrap loss is less than 2%

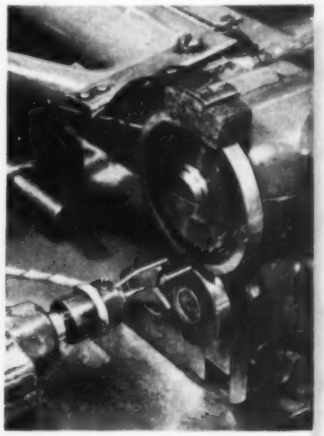


Double hobbing setup used when pivots are more sturdy and can stand the heavier load. As in the milling setup, one cutter rough cuts, and the other finishes. For work of this nature, hobs must be sharp, and a careful check must be kept on spindle bearing adjustment. Hob and spindle must run absolutely true

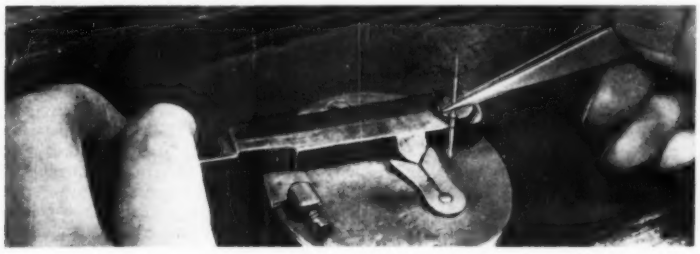


Vertical hobber for cutting teeth in brass wheels. In this setup, the workpiece is a spring housing with an integral gear, and the parts must be machined one at a time. The carbide-tipped toolbit (foreground) is arranged to contact the lower face of the work, and removes the burrs

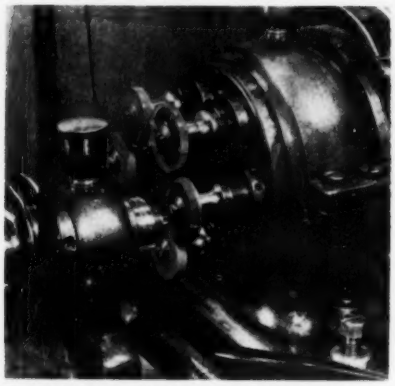
Bevel-gear hobbing is performed with a single-tooth hob having a helix equal to the circular pitch of the gear. The same machine can also be used for cutting face, spur, and helical gears



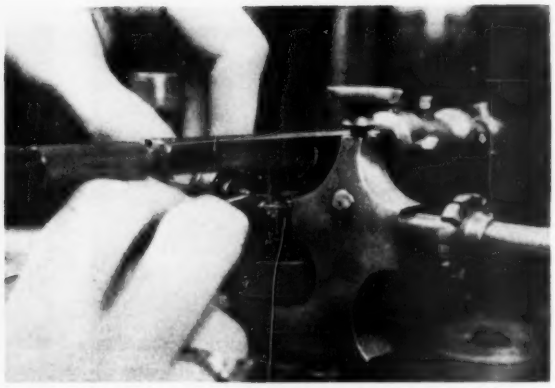
Carbide-wheel burnisher for pivot ends is adaptable to a wide range of parts. U-notches in lower support wheel are made with different radii to suit different parts. Opposite end of work is held in a female center, and work is driven by a spring dog engaging a projecting wire



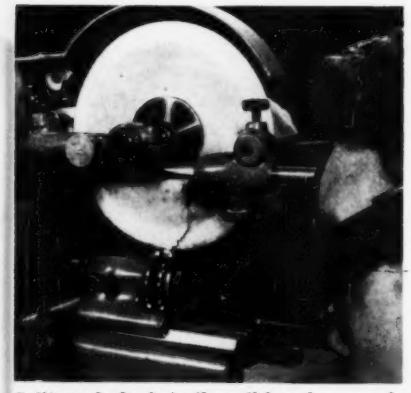
Spring driving dog is located on a pin and is opened by forcing a pointed projection on a hinged lever into the split. Loading and unloading is performed while another part is being burnished



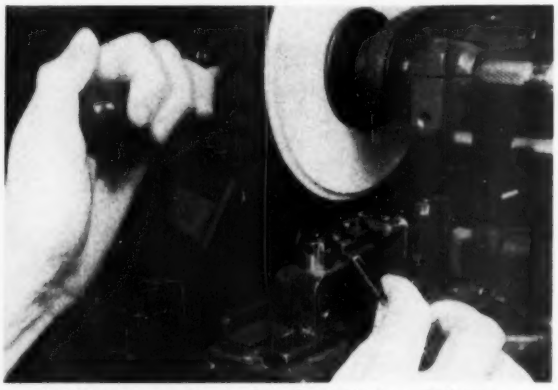
Turret-head, multiple-wheel polisher carries six different styles of wheels for a wide variety of polishing operations on pivots. Work is held in a collet chuck



Solid carbide bar, reciprocated by hand, is used for polishing extremely fragile pivots. One end is held in a collet, and the end to be polished is supported in a U-notch. About three strokes of the bar are sufficient to produce a high finish



Split-wood-wheel tooth polisher has wooden wedge forced into split to create a helix for rotating the work. Each revolution of the wheel moves the work one tooth. No polishing compound is required. Same wheel can be used for various pitches by changing wedge position



Solid beech wheel has a thread cut into its periphery to produce rotation of the work when polishing the teeth. This method requires a fresh thread to be cut for each different pitch of gear, but is often preferred for high-production work where frequent changes do not occur

Tips FOR TOP SHOP MEN

410 Experience isn't always the best teacher. If you're breaking new ground, get the experience of others, but don't be slavish and copy it. There's no point in asking a dead man how to die.

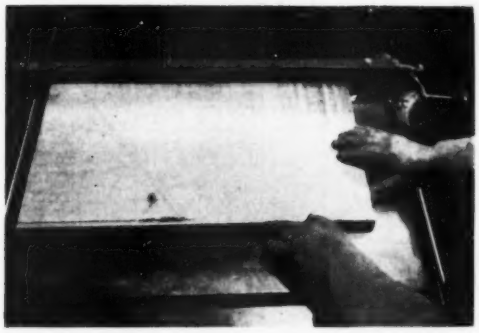
411 One labor expert we know made his reputation by giving labor everything it asked for. Such a policy works only temporarily.

412 Before you decide finally that all your men are dumber than you, be sure the cause isn't your own dumbness—the inability to convey what you are thinking.

413 If you give merit raises on a periodic basis, don't telegraph your punch to the whole organization by calling the raisees in one after the other—or, worse yet, by asking one to tell the next one to step in. Any variation of routine, or sequence of events, is promptly noted—and comparisons are inevitable.

414 When a chain of jobs, or ideas, is going 'round and 'round in your mind, write it down. That will relieve your mind and probably solve the problem — thus killing two nightmares with one stone.

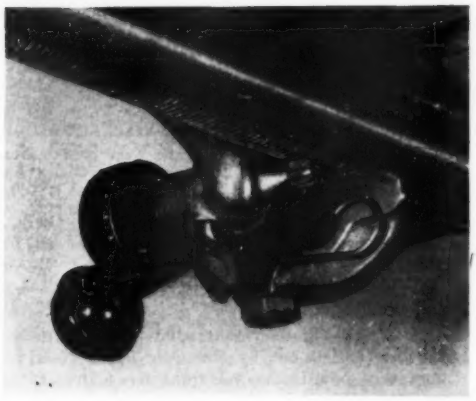
415 If you hire a company employee to do a personal job for you on his own time, do it privately—and preferably outside the plant. Such deals always start rumors—of favoritism, apple polishing, or what have you.



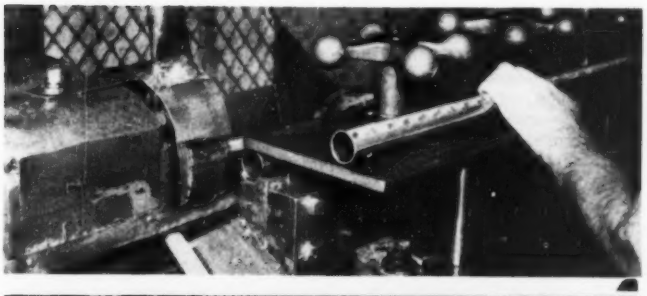
CONVERTED LATHE HOBS TUBULAR RACKS

Plenty of ingenuity, plus a venerable engine lathe, makes a serviceable, special-purpose hobbing machine for an unusual job

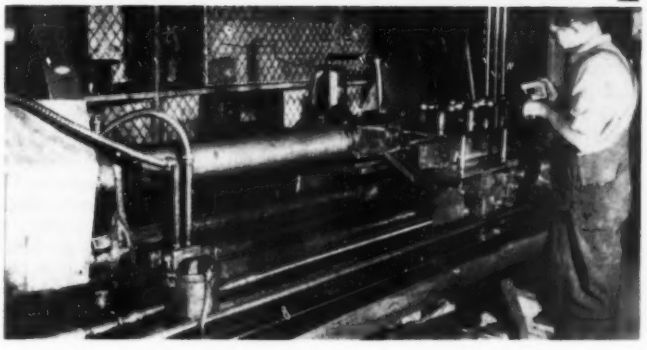
BY MARTIN HEINRICH, Superintendent,
DELTA MFG DIV, ROCKWELL MFG CO.



Steel tubes, 36 in. long and 1¾ in. OD, support the guide fence of a Delta circular saw. A 0.1-in.-pitch rack on underside of one tube is hobbed on an old Barnes lathe converted for the job. Spindle is driven by a 3-hp constant-speed motor, and a ¾-hp motor provides rapid traverse of carriage at end of hobbing cycle. Rack engages with pinion for adjusting the fence across the table to set width of cuts



Cross-slide is removed to permit mounting a long V-block parallel to the ways, and a clamp plate with four screw clamps. The 6-in.-dia, five-lead hob is supported on an arbor extending from a bearing block mounted about 4 ft from the spindle nose

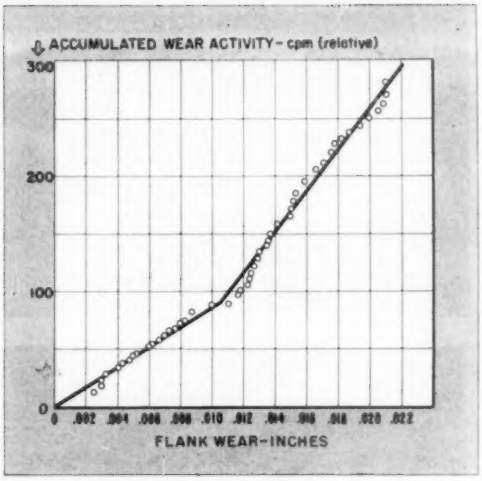


Drive shaft from spindle to hob is 5¾ in. in dia to minimize vibration, and is driven by 1:1 gear at the spindle nose. Production rate is 25 pieces per hr. For cutting, fixture is moved forward to a positive stop and is retracted to clear hob on rapid-traverse return

RADIOACTIVE TRACERS SPEED TOOL LIFE STUDY

Wear of a cutting tool can be measured accurately and rapidly by Geiger tube by this new method. It offers tremendous time and material savings

BY E. J. TANGERMAN, EXECUTIVE EDITOR



1 Accumulated radioactivity of the wear products on the chips, throughout a life test on the cutting tool, correlates well with the wear of the tool as measured on the flank with a microscope in the conventional way. Cutting speed was 591 fpm, feed 0.0036 ipr, on a tubular workpiece (0.200-in. wall) of SAE 8650 steel. Approximate specific activity of the tool was 6.5 millicuries per gram

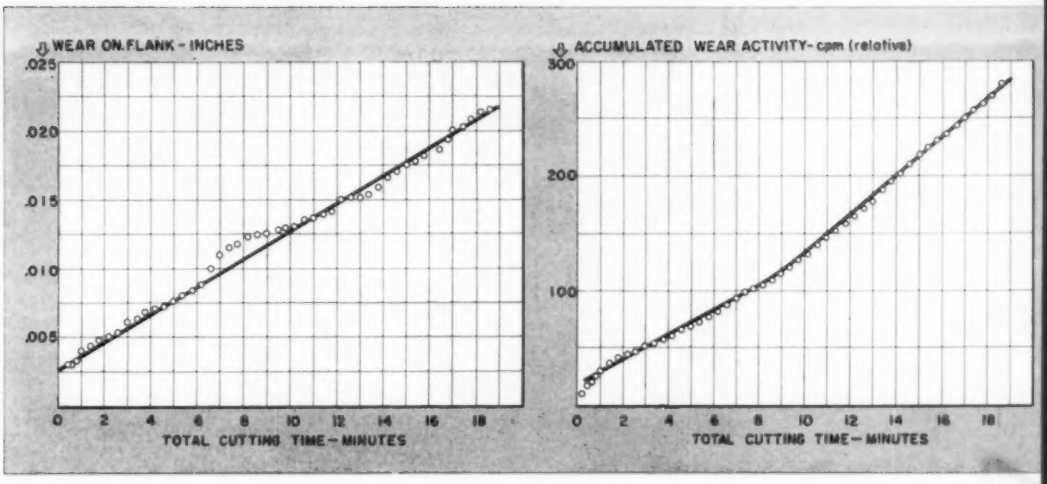
AN OUTSTANDING new development in the metal-cutting research field has just been announced in the *Journal of Applied Physics* by M. Eugene Merchant and E. J. Krabacher of the Cincinnati Milling Machine Co. Research Department. As stated in this article, life between grinds of cutting tools is a major factor in the costs of most machining operations. Research designed to discover and develop ways of increasing tool life requires means for accurate measurement of tool wear and life. Such measurements, normally made as controlled laboratory tests, require hours of time and hundreds of pounds of metal when carried out by conventional means. Testing under accelerated conditions, as by using abnormally high cutting speeds, gives results which do not agree with practice.

In looking for ways to circumvent the use of the costly conventional methods of measuring tool life, the idea was conceived of using radioactive tracers to measure the "instantaneous" rate of tool wear.

The method consists, in essence, of machining with a cutting tool which has been rendered radioactive by neutron irradiation in a nuclear reactor and measuring the radioactivity of the collected particles worn from the tool during a few seconds of cutting. This is done conveniently by measuring the radioactivity of the chips removed during that few seconds of cutting, as it has been found from the present study that well over 90% of the radioactive tool material worn away during cutting remains attached to the chips.

In this initial investigation, the cutting-tool material used was a sintered carbide composed of WC, TiC, TaC and Co. Service irradiation of this material was carried out by the Oak Ridge National Laboratory on authorization from the Isotopes Division, U. S. Atomic Energy Commission. The resulting effective tracer radioisotopes were W 185, Ta 182 and Co 60. Results of a series of cuts taken on SAE 8650 steel, starting with a sharp tool, are shown in Fig. 1. Here the accumulation, throughout the test, of the radioactivity of the chips (which is proportional to the amount of radioactive tool material present on the chips) is plotted against the wear of the tool as measured on the flank of the tool with a microscope in the conventional way. (The activity of the chips was measured with a heavy-wall Geiger tube and thus represents gamma radiation only.) The correlation and its linearity are evident. While the scatter of the experimental points may seem disturbing at first, Figs. 2 and 3 show that this effect is a result of "cascading" of the gross wear on the flank (as measured with the microscope, Fig. 2) and not from any irregularity in the over-all actual wear rate as measured by the activity of the chips (Fig. 3).

The "cascading" effect seen in Fig. 2 is well known and is one of the important factors preventing the obtaining of reliable measurements of the rate of tool wear from short-time tests, covering only a small portion of the wear curve, when using conventional methods. Because this "cascading" effect is absent in Fig. 3, it is apparent that an accurate measure of the rate of tool wear can be obtained by averaging the values for the activity of the chips (counts per minute per gram of chips) obtained



2 Wear on the flank of the cutting tool, when measured with a microscope in the conventional way throughout the life test, exhibits "cascading." This cascading effect is a usual occurrence. The carbide 78 tool was ground with 0 rake, 7° clearance

3 A smooth, linear relationship exists between the activity of the wear products on the chips and the elapsed cutting time in the life test. The rate of tool wear can thus be measured by making a few cuts of a few seconds duration each, and relative tool life values for different cutting conditions can be quickly obtained

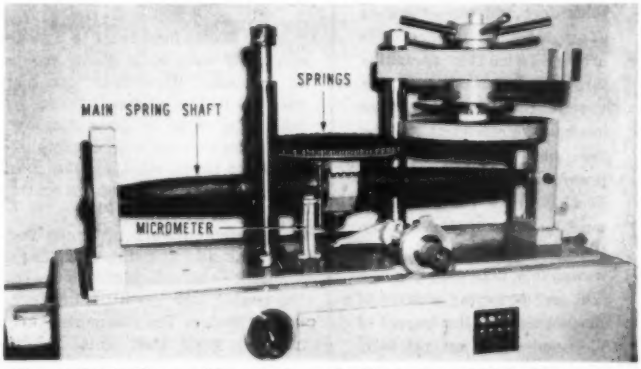
from only a few runs of a few seconds duration each. It is evident that the method is especially well suited to the rapid determination of relative values of tool wear and tool life when evaluating the effect of a series of different cutting conditions, as for instance a series of different cutting fluids or work materials.

The authors acknowledge the many important contributions of Hans Ernst, Research Director, to the practical realization of this method of measuring tool wear.

New Machine Speeds Spring Testing

A new spring-testing machine at the New York Air Brake Company, Watertown, N. Y., subjects high-alloy springs to 20,000,000 cycles of tension and compression for fatigue-testing before assembly.

Springs are positioned on work plugs between two compression plates. The upper is adjustable for correcting the mean setting and swings open for loading and unloading. The lower plate is attached to the main spring-shaft of the machine and is actuated by it. An adjustable cam regulates the amplitude and vibration of the main spring-shaft.



New spring-testing machine speeds production-testing of high-alloy springs for aircraft hydraulic pumps. Main spring shaft actuates lower compression plate. Amplitude is adjustable. Upper plate is shown in open position. Machine is second of its kind; Air Force received the first

The new machine operates at 3600 rpm and runs through the 20,000,000 cycles in approximately 99½ hours continuous operation. Springs then are checked for load weight and defects.

Spotwelder control circuit, equipped with electronic timer and power control, is preset for given gage of stock and electrode size; then operates at fixed cycle

WHY are shop men swinging to tracer controls and followers on contouring lathes for many production jobs? The answer is that hand controls just aren't accurate enough; even on machines of high inbuilt precision. Closer tolerances and higher orders of production requirements are gradually spreading throughout Metalworking, and the resultant trend toward mechanical, electrical, hydraulic, and pneumatic power proves that electronics must become more important to machine-tool builders. Perhaps electronics will never completely take over the control and powering aspects of machining, but the impact of electronics has not yet fully hit industry. Here is a general survey of electronic methods for the shop: What they can do today, how they may be adapted tomorrow, and a view or two into the future.

ELECTRONICS AT WORK

BY JOHN STARR

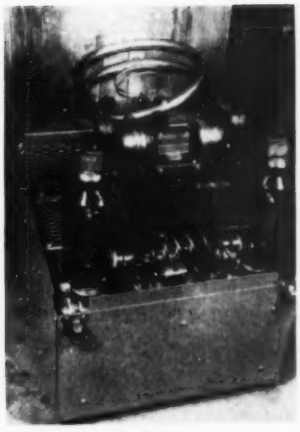
Radio men refer to a given electronic tube as a diode, triode, or pentode, depending on how many working elements there are inside the metal or glass envelope. But regardless of size or complexity, most tubes work on the same principle. Take a representative triode, for example:

The elements are arranged vertically inside the tube, with the filament (also called the heater) in the center, and the others concentric around it. The filament is a resistance wire that gets red-hot when a 6-volt, 0.2-amp current is passed through it. Close around the filament is the cathode, which is made of a metal that will readily throw off electrons when it is heated. Around the cathode is a porous screen, called the grid, through which the electrons can flow, and on the outside is a solid metal tube, called the plate.

Tube action is like this: The filament heats up, warming the cathode. Electrons "boil off" of the cathode, pass through the grid, and go to the plate. From the plate, they are carried by conductors to the next electrical or electronic device in the circuit, whatever it may be.

Electron flow from the cathode to the plate is heavy. Therefore, if a small charge, oscillation, or pulse is placed on the grid to accelerate or retard the flow of electrons through the grid, the output from the plate will have the same character as the charge (usually called the signal), but will be of much higher power. This is the multiplying effect of a tube—one of its most important functions. Another job a tube can do is to rectify current; that is, it allows electron flow in only one direction (from

Drivematic riveter working on aircraft panels has electronic safety devices that prevent operation until head is centered over drilled rivet hole



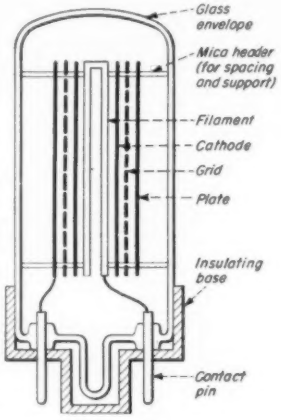
Electronic induction heater shows simplicity of some industrial equipment. Tube life is in hundreds of thousands of hours; other parts last indefinitely

cathode to plate), which may produce direct current from alternating current.

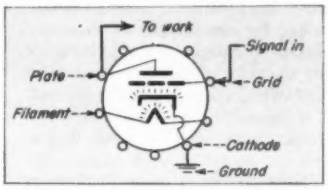
Applications

Now, if a strain gage is placed in the circuit to operate the grid (one terminal attached to the grid, the other to ground), the gage can be made to operate a meter. The original signal is much too small to move the meter arm, but if the signal is multiplied by a tube, or by two or three tubes, the signal can be built up to proper strength. Grid control of the electron flow from cathode to plate is accurate, so the output from the tube will be a true enlarged signal from the gage.

The signal applied to the grid of a tube can be any number of electrical pulses. It might be a single pulse, which would be built up to a high level in an electronic amplifier: A device with a number of tubes, each boosting the signal in turn. Then the output pulse from the last tube, at this stage a heavy surge of power, could be applied to a solenoid to trip the starting switch of almost any mechanical device.



Typical triode (sectional view) has three functioning parts, plus filament in middle, glass envelope, and mechanical parts

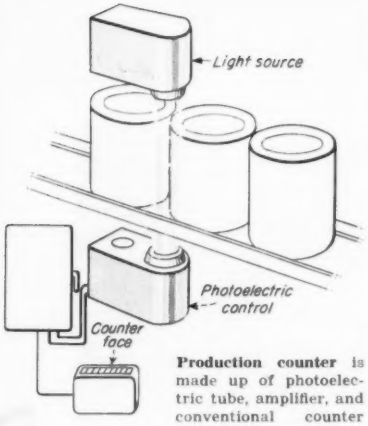


Same triode (schematic diagram) in simplest hookup has cathode connected to ground, grid to signal source, and plate to operating mechanism or grid of next tube

The signal might also be a steady, oscillating frequency. Such a signal can be produced within the electronic device with a tube, coils, resistors, and capacitors. The oscillation can be controlled by the grid of the first tube in the device; and the output could operate a different solenoid, connected to a control lever or precision switch on the machine. Thus, as long as a weak signal is applied to the grid of the first tube, an oscillating signal will operate the solenoid, and the machine will operate.

This illustrates how electronics provide safety, for if anything goes wrong at the signalling device or in the amplifier, the solenoid will not be operated and the machine will not run.

Another example: A press, loaded automatically by a feeder, can be equipped electronically so no false press closings, no jams, no



Production counter is made up of photoelectric tube, amplifier, and conventional counter with electrical operating mechanism

non-producing cycles are possible.

A switch on the press ram can be actuated as the ram rises to the top of its stroke to charge the grid of a tube. The tube output can be fed to an electronic timing mechanism on the feeder, actuating the feeder for the length of time required to complete the loading of one part. As the ram descends, the first switch opens, stopping current flow through the tube. The electronic timer; another tube device that can be set to work almost like a clock, then discharges an electron pulse after a period to do work; goes through its cycle and applies power until a new part is loaded into the press dies. As a safety measure, a precision switch can be located inside the die so the part will depress it when loaded. The switch can be hooked up to a tube in the power supply of the press or in an electronic clutch control so failure of a new part to depress the switch would prevent the ram from descending.

Safety With Electronics

The thing about electronics is that, although many of the jobs they do can be done by ordinary electrical devices, electronics provide ideal safety. If anything goes wrong in the circuit, the tubes fail to function, and no actuating impulses are sent to machines. If something goes wrong with the signalling device that controls the tube, no impulse is sent out. In a lot of cases, this feature can be built into the circuits to save thousand of dollars worth of equipment with relatively little extra cost.

Of course electronics can do a number of things that ordinary electrical devices cannot. The photoelectric tube is one electronic device that has thousands of applications, and many thousands more not even tried out as yet. Its ability to convert a visible (or even an invisible one — using infra-red light) impulse into an electrical one is unique.

In adjustable-speed drives and controls for machine tools, electronics provide infinite variations of speeds and feeds, more accuracy than with older methods, and simplicity of controls—allowing use of less experienced operators on machines that turn out better, more intricate work. Adjustable speeds that cover ranges much greater than ever before make machines much more versatile, too.

Controls are not the only application. For specialized power problems, where current of a particular nature must be provided, rectifiers can be installed. These can be tubes, ranging in size up to a couple of feet high, or can be selenium plates. Electronic power supplies provide larger ranges of voltage and amperage than pure electrical circuits with rheostat controls, and are more accurate.

Versatility

A few new things electronics can provide are: Constant surface speeds, constant tool load, instant speed changes during a cut, and almost perfect tracking of a master in tracer machining. Mechanical, hydraulic, and electrical control devices for machine tools operate from a single actuating brain source. But, if it is desirable, electronic controls can be made to respond to more than one influence, with infinitely variable effects, and with proportioning devices that can, say, increase the spindle speed of a lathe as the tool load lightens up, and at the same time increase the tool feed at a varying rate to correspond to the spindle speed.

On a tracing job, where a bar of irregular shape is to be cut, it is possible to get maximum production out of the tool by adding electronic devices to the feed and speed mechanisms. Assuming the bar has not been roughed to shape, the heaviest tool load would take place where the work dia is least. Variable resistors tied in with the controls could be attached to the slide and saddle, and as the slide advanced for a deeper cut, one resistor could be adjusted to reduce the tool feed, for the load would otherwise increase. But the spindle speed would have to be increased to keep the surface speed the same; therefore, the resistor (or another one like it, but tied into a different part of the circuit) would have to speed up the spindle.

When the tool backs out to a larger dia, the spindle speed would have to be dropped gradually, in direct proportion with the distance from the tool tip to the centerline of the work, and the feed would have to increase, in proportion to the load. This sounds complicated, and is, at present. However, somewhat similar operations are handled by various sections of some radio equipment; and it is entirely possible that research and engineering will work out many specialized industrial circuits to convert machine motions into electronic impulses, and electronic impulses into machine motions.

Germanium diodes and transistors, often effective replacements and additions to tubes, offer the advantages of small size and high power; which will eventually result in even smaller electronic panels and chassis than now. Although the usual machine-tool electronic control panel nowadays is a large separate housing, mounted next to the machine it operates, it is probable that eventually electronic controls will be small, slide-out panels mounted right into the machine headstocks or main control boxes. By that time, more will be known about electronics, and a great deal more will be known about how best to utilize, design, and install electronic devices to give maximum service in the production shop.

Can Die Clearance Be Excessive?

What is your experience with clearance differing from the textbook rules? Can you supplement the author's findings?

BY FEDERICO STRASSER

Recently, I had a rush job in which pierced holes in 0.0315 in. copper stock had to be changed from screw-clearance size (0.1378 in.) to tap-drill size (0.0984 in.). So, I merely substituted a smaller punch in the die, and was amazed to get good holes, even though the clearance was 15 times or more that prescribed in the textbooks (5 to 8% of stock thickness).

This experience prompted me to experiment with four small dies (0.2756 — 0.1968 — 0.1378 — 0.0984 in.) in an effort to find the top limit for die clearance with various materials. This work was carried out in the type of universal die shown. In this tool, parts are interchangeable. Normally, for a change in hole size, the punch, coupling nut, guide bushing and die bushing are changed. For the experiments, however, the punches were changed to various sizes of cutting-edge diameter with relation to the die-bushing diameter.

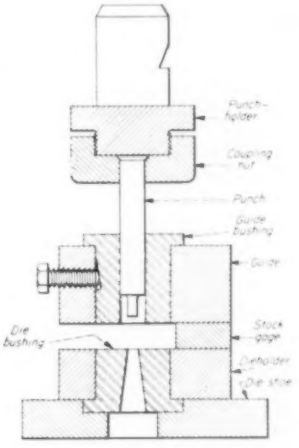
By reference to the table, you will see that a legend is exploded, namely: "In sheet steel, it is impossible to punch holes of less diameter than the sheet thickness."

In the experiments, I was able to punch holes of diameter less than half the stock thickness. But as seen, the solution lies in great clearance, adequate punch guiding, polishing of parts, and good stripping. Has anyone made a systematic research on die clearance?

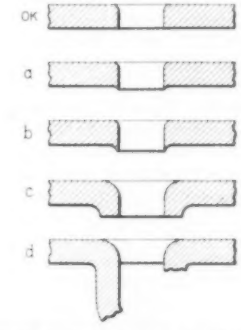
TYPES OF HOLES PRODUCED BY "EXCESSIVE" DIE CLEARANCE

Note: Approximately equivalent results obtained on copper and soft steel

				0.0118 copper		0.0315 copper & iron		0.0472 iron		0.1250 copper & iron	
Die-hole dia. in.	Punch dia in.	Over-all clearance, in.	Clearance as % of die hole	Clearance, % of stock-thickness	Results	Clearance, % of stock-thickness	Results	Clearance, % of stock-thickness	Results	Clearance, % of stock-thickness	Results
0.2756	0.2677	0.0079	2.9	67	*OK*						
	0.2500	0.0256	9.3	217	*b*	82	*a*	54	*a*	25	*OK*
	0.2264	0.0492	17.8	416	*d*	156	*b*	104	*b*	39	*a*
	0.1968	0.0788	28.6			250	*c*	167	*c*	63	*b*
	0.1772	0.0984	35.7			313	*d*	208	*d*	79	*c*
0.1968	0.1772	0.0196	10.0	166	*b*	62	*a*	42	*a*	15.7	*OK*
	0.1614	0.0354	18.0	300	*d*	112	*c*	75	*c*	28.3	*b*
	0.1496	0.0472	24.0			150	*d*	100	*d*	37.8	*c*
	0.1279	0.0689	35.0							55	*c*
	0.118	0.0787	40.0							63	*d*
0.1378	0.1260	0.0118	8.6	100	*b*	37.5	*a*	25	*OK*	9.5	*OK*
	0.1181	0.0197	14.3	168	*c*	63	*b*	42	*b*	15.7	*OK*
	0.0984	0.0394	28.5	335	*c*	125	*b*	84	*b*	31.5	*a*
	0.0827	0.0551	40.0	465	*d*	175	*c*	116	*c*	44	*b*
	0.0708	0.0670	48.5			212	*c*	141	*c*	53.5	*b*
	0.0590	0.0788	57.0			250	*d*	167	*d*	63	*b*
0.0984	0.0866	0.0118	12.0	100	*b*	37.5	*OK*	25	*OK*		
	0.0787	0.0197	20.0	168	*c*	63	*b*	42	*a*		
	0.0708	0.0276	28.0	234	*d*	88	*b*	58	*b*		
	0.0590	0.0394	40.0			125	*b*	83	*b*		
	0.0472	0.0512	52.0			162	*b*	108	*b*		
	0.0354	0.0630	64.0			200	*c*	133	*c*		



Holes of various sizes can be pierced in this universal die, because the punch, coupling nut, guide bushing and die bushing are made in interchangeable sets



Effect of clearance—(*a*) small burr, (*b*) some embossing around hole, (*c*) embossed, but good for tapped holes, and (*d*) clearance exceeds punchable limit

You will keep your costs down and your product priced competitively if you . . .

SPEND YOUR DEPRECIATION ALLOWANCES

BY FREDERICK S. BLACKALL, JR.
President and Treasurer, The Taft-Peirce Mfg. Co.
President, National Machine Tool Builders' Association

A simple rule should be applied to depreciation allowances — **USE THEM.**

No single factor has contributed so importantly to the continued existence of obsolete plants as the failure of management to spend its depreciation allowances for new and improved equipment as a regular and unfailing routine year after year.

Depreciation, in its simplest terms, is a charge recognized by law which represents the estimated loss in value occurring progressively through the life of a capital asset as a result of wear and tear or obsolescence. This charge is part of the cost of doing business.

In the interests of accuracy, depreciation ought to be called a capital recovery allowance. The reason why, under Internal Revenue regulations, a manufacturer is permitted to recover through untaxed earnings that portion of the cost of his capital assets which is represented by the annual depreciation allowance, is simply this: The money involved does not constitute a profit at all, but is in reality a part of his original capital investment in plant and equipment which he is using up in filling orders.

DON'T DIVERT YOUR FUNDS

The manufacturer who diverts these funds to other purposes, such as dividends or salaries, is taking a chunk right out of his plant. Under such conditions, his factory inevitably will deteriorate.

There is only one thing to do with depreciation allowances: spend them on renewals and replacements. This should be done, if practicable, within the year in which the depreciation accrues. This is entirely feasible in the usual metalworking plant having a multiplicity of machines of wide variety.

The money need not be spent to replace the item which is being depreciated, as that item may not have worn out. But somewhere else in the shop is a machine ready for the scrap heap, or so out-of-date that it belongs there. The depreciation accumulated on a newer machine may be borrowed temporarily to replace the more ancient one.

The metalworking management which spends its entire depreciation allowance each year, or puts aside equivalent funds for periodic spending, is well on its way to sound replacement policy. But in this era of rising prices, the accrued depreciation alone is not adequate to maintain the original capital investment without erosion. The company which wants to keep up with competition must increase its appropriations for renewals and replacements, at least in good years, by a substantial appropriation from earnings.

Too often depreciation is understood only at the top-management level, and perhaps in the accounting department. The failure of engineers and technical supervisory staffs to grasp the nature and purpose of depreciation reserves has resulted in much wasting away of industrial assets through wear, tear, and obsolescence without systematic replacement.

SELL YOUR BOSS

The junior executive, charged with responsibility for keeping a mechanical plant at peak efficiency, often wants to buy new equipment, but comes a cropper because he does not understand how depreciation allowances operate. He would have far less trouble if he could sell his boss on the company's ability to provide the desired appropriation. He should realize that this money is available through the revolving fund which can be accumulated from the deduction of depreciation allowances as a business expense for tax purposes. He should take advantage of the powerful argument implicit in the presence of depreciation reserves on the books of every industrial corporation.

Among the several procedures allowed for depreciating capital assets, the simple straight-line method is probably the most widely used. This calls for determining the probable useful life of the equipment and pro-rating the write-off over that period. Thus a machine on which the Treasury Department recognizes a useful life of 20 years would be written off at the rate of 5% a year. This method has the advantage of simplicity, and usually gets the asset off the books in the minimum length of time.

A less-common method is known as the "fixed percentage of a declining balance." Treasury regulations stipulate that the fixed percentage of write-offs under this plan must not exceed by more than 50% the annual percentage permitted under the straight-line method. Under this procedure, the taxpayer would be allowed to write off 7½%, for example, rather than 5% during the first year. During the second year, he would write off 7½% of

the undepreciated balance (7½% of 92½%), and so on annually. The advantage of this method is that it tends to concentrate the larger write-offs in the earlier years of the asset's useful life, but the entire cost is never written off. Whatever sum remains on the books at the end of the asset's useful life is charged off only when the asset is sold or scrapped.

Less well-known is the unit-of-production method of depreciation. Here the original cost is divided by the number of production units which it is estimated will be manufactured by the equipment during its useful life. A certain fractional cost of the equipment thus becomes an earmarked part of the cost of each unit produced. The amount of depreciation taken in any year depends solely on the number of units made in that year.

A fourth method is currently available to certain manufacturers under special provisions of defense tax legislation, known as "amortization under a certificate of necessity." For practical purposes, the words "amortization" and "depreciation" may be regarded as synonymous. A manufacturer whose product can be shown to be essential to national defense may apply for a certificate of necessity for acquisition of any new capital facility, whether plant or mechanical equipment. The certificate is simply an authorization to depreciate the cost of the facility, or a stipulated portion thereof, over a five-year period. This is three or four times as rapid as the average write-off permitted for machine tools under Internal Revenue regulations, and is five to ten times the average for plant and buildings. The straight-line depreciation method is used, but the government usually does not permit the five-year write-off to apply to 100% of the cost.

APPLY NOW

Certainly every company which can qualify for five-year amortization should apply for certificates of necessity on all equipment or plant improvement purchases which must be capitalized. But remember: No application will be considered after January 1, 1952, unless it is filed before the order is placed.

No rule is laid down by government as to what depreciation method is to be used. This is largely left to management's personal preference. But in the interest of consistent plant modernization, the best plan probably is the one which will get the bulk of the cost of the asset off the books in a minimum time, if depreciation allowances are reinvested regularly in renewals and replacements.

The accelerated depreciation provisions in force during World War II stimulated immeasurably the expansion and modernization of America's industrial plants. Precisely the same thing has happened in every nation which has adopted a liberal depreciation policy. One wonders why, in the face of this experience, our government clings to an outworn policy, except in periods of dire emergency, of stretching the useful life of capital assets to the limit and squeezing the manufacturer's depreciation allowance to an irreducible minimum. It is one of the most short-sighted of all our national policies, one which is founded on a shocking disregard of elementary economics. The best and simplest thing to do is to let the taxpayer determine his own depreciation policies, as he largely did until 1934.

Canada recently has recognized the cogent influence of depreciation policy on capital investment by applying it in reverse. Faced by an inflationary consumer-goods boom at a time when its productive capacity is strained to meet military needs, it is discouraging the purchase of new plant and equipment by deferring for four years any write-off for tax purposes. Exception is made for selected industries with high priority ratings. The government emphasizes that this change in depreciation regulations represents deferment rather than cancellation.

A DOUBLE-EDGED SWORD

During World War II and thereafter, the accelerated depreciation of assets was used effectively in Canada to encourage investment in new plant and equipment, thereby increasing production of peacetime goods. Now this policy has been reversed. But don't overlook the fact that speeded-up amortization on the five-year basis is still allowed for capital additions necessary to defense production. Thus the depreciation allowance becomes a double-edged sword with which to curtail unwanted expansion and to expedite needed production.

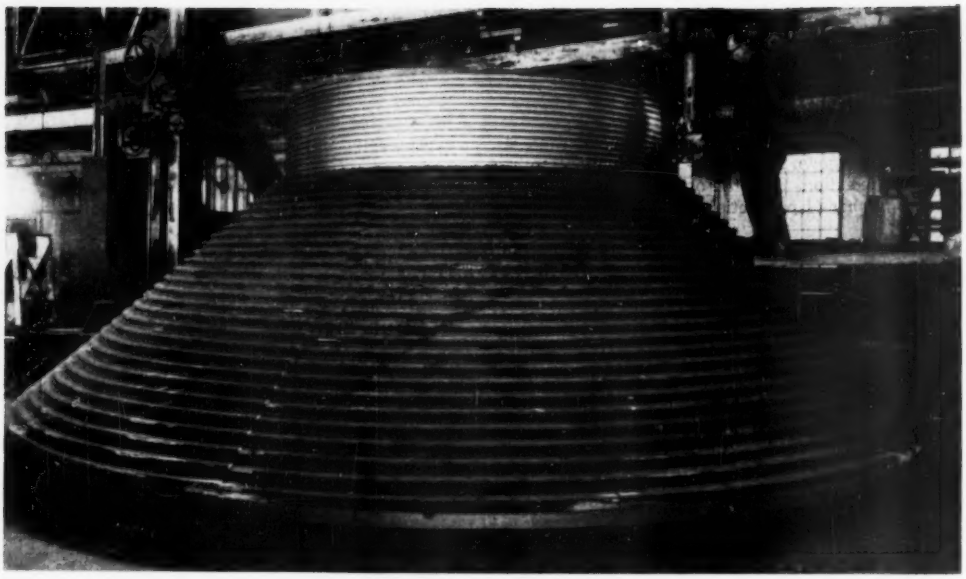
For anyone seriously interested in understanding the principles and application of depreciation in a business enterprise, Lewis H. Kimmel's "Depreciation Policy and Postwar Expansion" is "must" reading. It can be secured at 50 cents a copy from the Brookings Institution, Washington, D. C.

The rapidity with which the cost of an asset can be recovered is a function of the profit which can be earned on it and of the rate at which it can be depreciated. For those who like to have a mathematical basis for checking their thinking on desirability of new-equipment purchases, study of formulas recently developed by MAPI and NMTBA is suggested. These are helpful where the extent to which the equipment will be utilized can be forecast with some assurance. If an old machine will turn out 10 pieces an hour, and a new machine double that number, it is fairly simple to calculate the potential savings, if you can keep the new machine busy.

Much new equipment is bought, however, because of quality factors, or to provide greater versatility in the capacity and performance of a particular plant, or for other reasons beyond simple time savings on a specific job. Automatic formulas are not too readily applicable in such instances. The decision must rest then on human judgments, as it probably does in most cases anyway.

Whether scientific formulas are used, or just old-fashioned common sense, there is no better insurance for the future welfare of your business than establishment of a consistent replacement policy. Acquaint your staff with that policy, then stick to it year after year, regardless of the business weather.

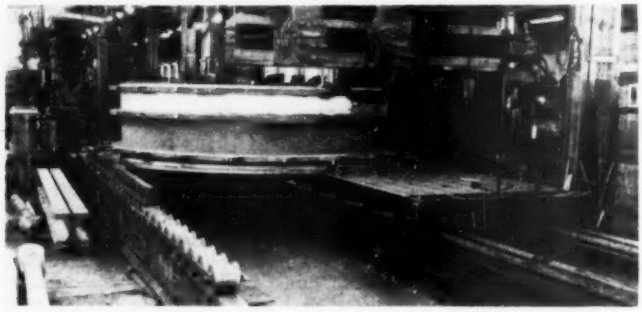
One problem that is always with you is to meet competition successfully. The wise and consistent use of depreciation allowances for replacement is one of the surest ways of achieving that objective.



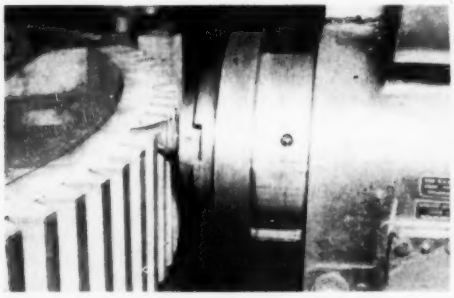
Mine hoist drum tapers from 12 to 25 ft in dia. Section at top was made in halves, conical part was built up from 12 segments. Pitch of the grooves is 2¾ in., and turning and grooving was performed on a 24-ft vertical boring mill

SHOP SHOTS

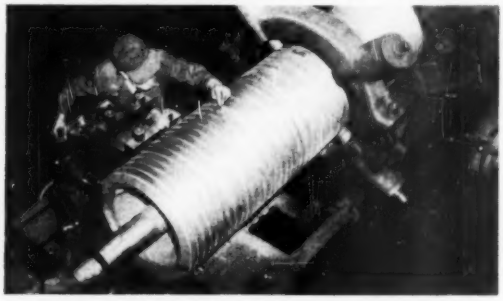
AT CANADIAN ALLIS-CHALMERS LTD.



Adjustable outrigger for open-side planer can be positioned anywhere from 5 to 10 ft from edge of table. Cast-iron rail is 40 ft long. Designed and built by CAC, only maintenance after eleven years has been roller replacement



Cast-iron spur gear, 131-in. OD, 12-in. face, 3-in. CP, 136 teeth, is machined on Ingersoll vertical mill with formed cutter and special index plate. First cut removes ¼ in. of stock, second cut 1/8 in., and finishing cut 3/16 in.



Special, nickel iron V-belt sheave for driving a 1200-hp mine ventilating fan has 47 grooves of 22-in. PD. Work is held between centers on its own shaft to insure absolute concentricity

How to Assure

SCREWTHREAD ASSEMBLE-ABILITY

BY WM. M. STOCKER, JR., ASSISTANT EDITOR

Screwthread interchangeability is largely a function of proper gaging; as long as parts gage correctly—even in selective assembly—the gage user actually need never know the physical measurement of the part. For this reason, we have divided screwthread inspection into two groups. "How to Inspect Screwthread Elements" (AM Oct. 15, '51) is primarily applicable to inspection of gages, but is also useful for qualifying very accurate product threads.

This report will discuss problems encountered and methods used when determining assemble-ability in quantity production. Planning is as important here as for any other manufacturing operation. Assemble-ability starts with the unmachined bar, forging, or casting. It is reflected in every manufacturing step and, once lost, is difficult if not impossible to regain. Final gaging will say "yes" or "no", but will not improve the condition. Whenever they are applicable, quality-control methods and in-process sampling are highly recommended. We suggest that as you read you picture your own operations, particularly as regards gage selection, gage control, speedier methods, and identification of rejects. Small efforts provide substantial rewards.

A SPECIAL American Machinist REPORT TO THE METALWORKING INDUSTRIES

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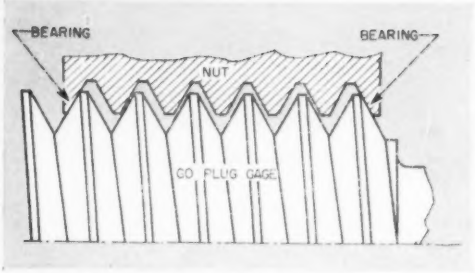
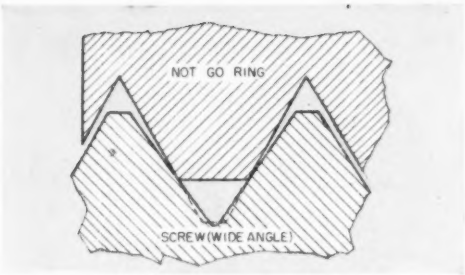
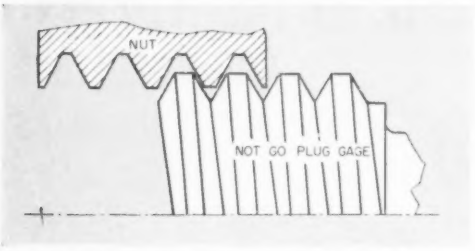


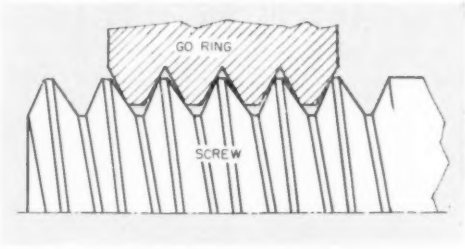
GO PLUG IN SHORT LEAD CAUSES FLANKS TO BIND



NOT GO RING CHECKS OPEN ANGLE ERROR



NOT GO PLUG REJECTING NUT FOR EXCESSIVE LEAD



DRUNKEN ANGLE SCREW BINDS IN GO RING

Typical faulty threads as they would be detected by thread plug and ring gages. Although gages indicate errors present, they do not show actual element in error. Undersize pd or open-angle errors on external threads also permit part to enter Not Go rings. All screwthread gages are based on the thread plug and ring, even indicating styles

GAGING METHODS

During the early years of interchangeable mass production, product limits were controlled largely by measurement. Among measuring tools used were ordinary machinist scales, micrometer calipers, and vernier calipers. They were seldom made to today's standards and master measures were not widely available, hence many "measuring" tools actually operated as gages. As long as mating parts were made to the same instrument they would fit, but take them to another shop, use the same dimensions on other instruments, and they would not join properly.

Skillfully used, modern micrometer and vernier calipers will measure accurately to close limits. Time is consumed in reading the instrument and comparing the reading with the specification to determine whether the size is within prescribed limits. Only the operator's judgment decides whether a product measuring on the borderline of a limit is within or outside that limit.

Measurement methods are still widely used where small quantities of parts are being manufactured. Gaging methods, in many cases, would not be economical because the time saved over measurement methods would be more than overcome by the gage cost. However, this is more true of fixed gages than of the variable or adjustable gages. The latter can be quickly set to blocks or other known measures and used with the speed of fixed gages.

Mass production of parts which must be identical within positive allowable errors requires some positive means of checking dimensions. Fixed gages are the most widely applied means. Whereas the measuring instrument determines the actual dimension, the fixed gage will ascertain if the product dimension is within the limits; no actual dimension size is established.

Fixed gages are identified by specific use. "Go" gages check the tightest metal-to-metal fit between mating components. These are called the *critical gages*, as they determine whether mating parts will be interchangeable. "Not Go" gages control the loosest fit. These are essential as they check the extreme product limits.

Like any other manufactured product, fixed gages must be made to toleranced dimensions. The direction and amplitude of this tolerance directly affects gaging efficiency. Standard basic procedure has been established to govern application of gage tolerance. For screwthreads, this can be found in "Screw-Thread Standards for Federal Services," available from Supt of Documents, U. S. Government Printing Office, Washington 25, D.C. Some gage manufacturer's catalogs also include this information.

Working and inspection gages made to the same limits will very often cause conflict between the Production and Inspection Departments. An Inspection "Go" plug gage made near the high limit may reject product passed by a Production gage near the low limit. This condition can be corrected by providing "Go" *working* plug gages made intentionally larger than the Inspection gages. (This will, in effect, curtail the allowed product tolerance.) Extra wear-life can be added to "Go" plug gages by the same procedure where undue wear is caused in gaging abrasive materials.

Screwthread gages are considerably more complicated than plain cylindrical gages. There are three principal elements of a screwthread: lead, pitch diameter, and thread angle. Each may have errors which will seriously affect interchangeability. All of the product errors of lead, angle, and pd must be contained within the allowed effective pd tolerance. A serious lead error could consume all or more of this effective pd tolerance.

"Go" plug and ring thread gages only establish that the components will be interchangeable. Each may fit its "Go" gage snugly and still the effective tolerance may be exceeded. If a serious lead error is present in a tapped hole, the "Go" plug thread gage will not enter for the full length of engagement until the actual pd of the hole is sufficiently larger than that of the plug thread gage to compensate for the diametral equivalent of the lead error. Angle error in the product thread has the same effect.

For this reason, "Not Go" thread gages are essential. They determine that accumulated thread errors resulting from lead and angle have not extended the product tolerance beyond its limit. "Not Go" thread gages which do not enter, or are not entered by, the part show that part pd tolerance has not been exceeded by too much lead error. This gage checks *actual pd only* and if it is oversize beyond the tolerance to compensate for excessive lead error, the "Not Go" gage would engage the product.

By truncating the crest and root of the thread to near the pd, serious angle error will also permit entry of the "Not Go" gage.

Fixed gages are also known as "limit" gages, and size is determined by *attributes*. This assures that a product is within prescribed size limits. Another method is known as "gaging by *variables*" and measures the extent of deviation of threaded product from prescribed size limits. Measurement is usually differential rather than direct. It is done with indicating gages instead of fixed gages.

Although most screwthreads are gaged with fixed gages, there is a tremendous variety of indicating gage designs. These instruments include optical, air, electrical, electronic, and electro-magnetic units and almost every automatic and semi-automatic gage operates on the variable principle. Some optical gages are suitable for both fixed and indicating operation.

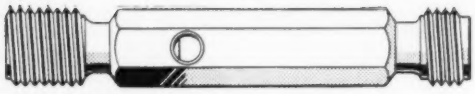
Where small quantities of parts are produced, and fixed gages are uneconomical, many indicating gages lend themselves to faster inspection. They are readily set to gage blocks or a master part and will quickly show assemble-ability when properly applied. This style of gage is also useful in salvage inspection to show how a rejected part varies from the given specifications. Although these gages usually require setting-up by an experienced person, most of them can be operated after only elementary instructions.

Regardless of the gage design or gaging method, all gages fall into the category of either attribute or variable. A particular gage may be either one depending upon how it is applied. But other than these two groups there is only straight measurement to known standards, and this is not considered "gaging." Proper selection of gages is very important to successful application.

GAGE DESIGNS

The first, simplest, and most widely used of all screwthread gages are the thread plug and the ring, these are purely complements of their mating parts, the pieces to be checked, and duplicates of the threaded portion of the part to be joined with the piece they check. Plug and ring gages are the earliest form of fixed gage and determine assemble-ability only. The thread plug is a cylindrical piece of metal (or carbide) on which the desired thread has been chased or ground, and preferably lapped. It is intended for gaging internal threads. Primarily, the thread plug provides a check on the combined function of lead, pd, and thread angle, particularly the "Go" plug. However, if the threaded hole has a length or depth of thread requirement, a flat may be cut on the threaded cylinder at 90° with the thread axis to a depth sufficient to provide for comparison of the part to the gage by feel with a fingernail or by the use of a straightedge. Also, when concentricity must be checked, a pilot is provided on the plug and concentric with the thread to permit the use of an indicator. Hence, thread plug gages will check lead, pd, angle, depth, and concentricity. Nevertheless, the first three elements are composite. Errors can combine to indicate an acceptable thread.

Chip grooves are slots cut through the first few threads at the entering end of a thread plug parallel to the axis and at a depth below the minor dia of the thread. Their purpose is to protect "Go" thread plug gages from jamming a chip against the thread flank. The groove serves as a reservoir to collect particles of metal which might restrain the gage from completely entering the component. It is not



Double-end thread plug gage with "taperlock" handle joint. Not Go end is truncated to check pd only and limited to a few threads

intended that these grooves be used to act as a tap. They are seldom provided on sizes smaller than 0.090 in. dia. One groove is required for sizes up to 2 in. dia.; three or more grooves spaced 120° apart are used on sizes over 2 in.

Single-end handles of aluminum, plastic or composition are usually preferred for thread plug gages over 1 in. dia, and double-end for under this size. Handles should be comfortable to hold without permitting slips, should provide a firm grip on the plug shank, and should have space for properly identifying the gage plus showing the last inspection date.

Three methods are used to fasten gages to handles. One is the "taperlock" which consists of a taper shank on the gage mating with a taper hole in the handle. This is usually used on the smaller sizes of gage. The second method is the "trilock" which provides a hole in the gage through which a retaining screw is passed and threaded into the handle. Three ears on the handle, spaced 120° apart, enter three grooves in the gage to prevent rotation of the gage.

The third method applies to reversible thread plug gages, which provide an effective means of increasing wear life. The entire plug is threaded to the required specification, then half of the plug is used to mate with the handle. When the gaging portion is worn below specified limits, the plug is reversed and a fresh gaging portion is available.

General practice is to use two gages, a "Go" plug and a "Not Go" plug, to check threaded parts. "Not Go" limit plug gages were recently reentitled "LO" limit gages for external threads and "HI" limit gages for internal threads. "Go" plugs have been described. "Not Go" or "HI" plugs are designed as closely as possible to check pd only. This is done by truncating the crest and clearing the roots of their thread form. Threads are acceptable if a definite metal-to-metal drag is felt on or before the third thread is reached when inserting a "HI limit" plug. It is also acceptable if the plug will not enter at all. This, of course, takes for granted that the "Go" gage entered satisfactorily.

One of the major problems with thread plug and ring gages is the length of time required to thread them onto or into the part. To overcome this, a number of tools have been devised. Among these are the segment thread plug, the roll thread plug, and the power driver.

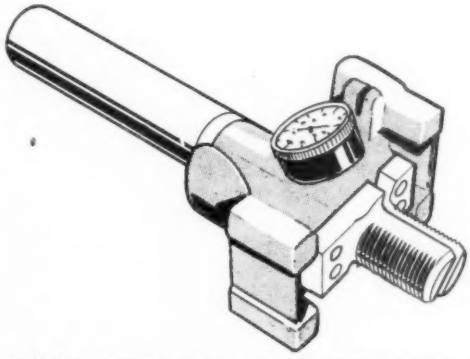
Several styles of retractable-segment thread plugs have been developed to eliminate the monotony of this operation and reduce inspection time. The segment gage is constructed so the expanded position of the spring-loaded segments is shown by a dial indicator. These gages are seldom satisfactory for inspecting both the maximum metal (Go) and the minimum metal (HI) limits simultaneously. The reason is simple. Standard gaging practice requires a pitch divided by 8 truncation on the "Go" member and p/4 on the "HI" member, to insure thorough inspection. Hence, segment gages should be used in pairs for a complete inspection. Gage truncations and root clearance should follow standard plug gage practice. Segment gages may be used with additional accessories to measure other thread elements. A solid thread ring gage is recommended for setting segment plug gages.

The initial cost of a complete set of segment plug gages for an internal thread is relatively high. Therefore, this method of gaging is most suitable for standardized high production quantities of work so that cost can be readily amortized by subsequent savings in inspection time.

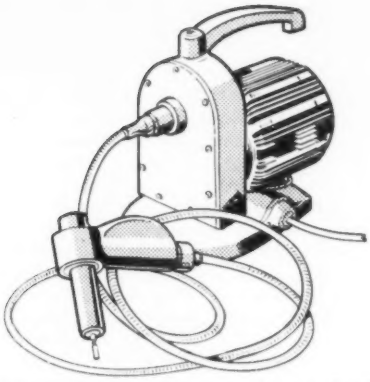
Roll thread plug gages of the bar design utilize two thread rolls of small diameter which are mounted on a spring-loaded telescoping center bar. This bar serves to expand and set the rolls firmly in the part being inspected. A gaging button is mounted on each member of the telescoping center bar. Acceptability of the part is determined by trying either a "Go" or "HI" feeler plug, or both, between the buttons, depending on the roll design.

Internal bar roll thread gages are suitable for holes of 7 in. dia and larger. Rolls can be made to check 60° form, Whitworth, Acme, buttress, and other special forms. The thread form on the roll is ground as a cylinder rather than on the true helix, hence cannot be successfully applied to threads having a large helix angle (7° or greater or to multiple threads). Sufficient accuracy is provided for most large diameter applications if the gage is used carefully. As the gage cost is relatively low, it is especially useful for low-production items. Rolls are replaceable so gages can be salvaged easily.

Another way to speed internal gaging is by use of a power-driven gaging handle. It eliminates manual rotation of the gage; thus reduces inspection



Indicating segment thread plug gage utilizes standard bench gage with interchangeable segments, including ring segments for external threads



Power driver for thread plug gage eliminates hand-rotation. Slip mechanism stops rotation, or backs out gage, if pressure is increased

time and operator fatigue. The unit drives the gage mechanically at 4 rev per sec by means of an electric motor. A slight change in the applied pressure causes immediate reversal or automatic disengagement of the drive. Four sizes are available for threads from No. 4 to ½ in. Caution must be exercised that the proper drive is used. A drive too powerful will have a burnishing effect on product threads.

Thread ring gages are the conventional means of checking external threads. A "Go" thread ring is designed to check the maximum pd, the clearance at the minor dia, the lead, and the flank angle, simultaneously. When an external thread on a part enters a "Go" gage completely, *assembly* with the mating internal thread is assured. However, as this also is a composite check, individual elements may contain errors which cancel each other out.

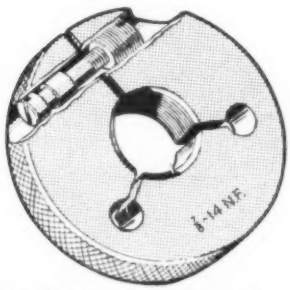
A "LO limit" or "Not-Go" thread ring is designed to check pd only, to insure that it is not below the minimum limit. For this reason, its thread form is truncated at the minor diameter and cleared at the root. Thus, the flank length is reduced and will bear only on the central portion of the component thread flanks. Root clearance is usually omitted on thread ring gages for 28 p and finer as it is not practical to provide clearance on fine pitches.

Thread ring gages are provided in either the solid or AGD standard adjustable styles. *The term "adjustable" must be considered with caution.* Maximum gage adjustment is 0.0002 in. It is used only as it is necessary to obtain a proper feel on the setting plug. It is a *ring* gage with the ring slotted for this adjustment, but the slightest squeezing of the ring must distort its true circle; thus vary gage elements.

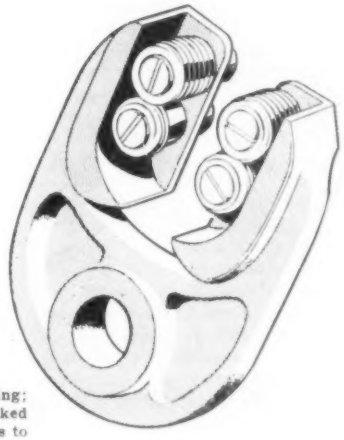
When an external thread specification includes a requirement for minimum length of perfect thread, that length is usually to the centerline of a full-form thread space on the component external thread, unless otherwise specified. The face of the "Go" thread ring gage may be ground square with the thread axis if the length to be inspected closely approximates the gage thickness. When the specified length is considerably less than the thickness of a standard gage, the gage may be counterbored from one side and the opposite face ground square with the thread axis. This will provide a surface for comparison of part to gage with the fingernail or straightedge. Of course, counterboring must be done on the gage blank before threading or hardening.

Chip grooves are not used on thread ring gages. The adjustment slots on adjustable ring gages also serve as chip grooves. There are usually three slots, equally spaced.

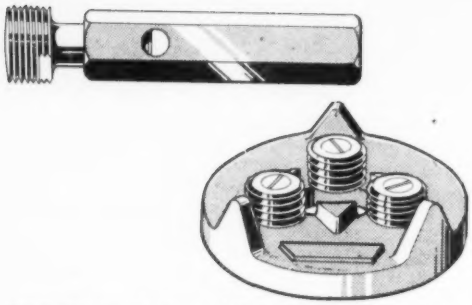
AGD standard thread ring blanks should be specified whenever possible. It is more practical from the standpoint of weight, handling, and distortion to



Ring thread gage for measuring external threads. Though split makes it "adjustable," maximum adjustment is only 0.0002 in. to permit proper feel on setting plug



Thread-roll snap gage provides longer life and faster gaging than ring; also checks Not Go along full thread length. Go and Not Go are checked in one pass. Flat-anvils, single-points, or segments may replace rolls to provide snap gage styles bearing these titles



Taper pipe thread plug and "Tri-Roll" gage for checking internal and external taper pipe threads at a predetermined point along the thread length

specify a thin gage whenever possible for large diameter thread ring gages.

Two problems are outstanding in the use of thread ring gages. First, they are strictly limited to the size for which they are made and second, they must be threaded on and off of the work. To overcome both of these, adjustable thread snap gages were developed. In one form or another, snap gages are used for production inspection of the major portion of externally threaded parts. Designs include single-point, flat-anvil, segment, and roll thread snap gages. Most snap gages use a frame approximately "C" shaped. Some units have a double "C" back to back, thus provide a "Go" and "Not Go" check. Other models place two sets of check points in line to gage "Go" limits at the outer position and "Not Go" at the inner position. Snap gages are also more suitable as "Not Go" gages, for a threaded part may be to size at the start, thus prevent a ring from being entered, but be reduced in diameter further along. A snap gage would detect this and the ring would not. However, this is an uncommon condition.

Major dia limits of external threads are usually checked by adjustable snap gages. The "Go" thread ring gage will assure assembly, but the "Not Go" major dia snap is also required to insure sufficient depth of engagement, hence thread strength. A "Go" major dia snap is seldom required as the "Go" thread ring gives adequate insurance of assembly. Major dia snaps are plain gages; not threaded.

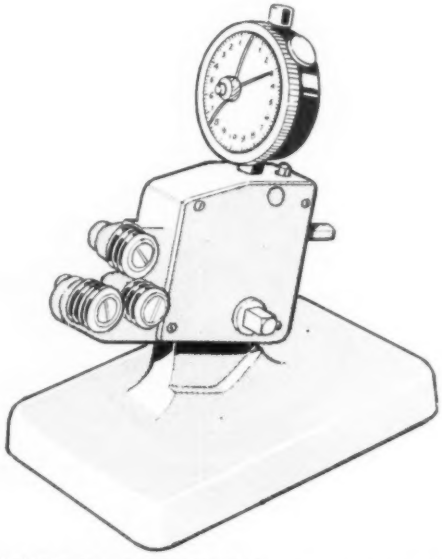
Segment thread snap gages, or segment thread rings as they are sometimes called, come in a variety of styles. They are constructed so contact is obtained on approximately 75% of the thread circumference and simulates thread ring gaging action. The segments are mounted on pivots to allow fast one-pass gaging of the full thread length. A component which will pass into and through the enveloping "Go" segments, but will not pass through the "Not Go" segments, is considered satisfactory.

Roll thread snap gages utilize two thread rolls of small diameter mounted on opposite sides of a "C" frame. The rolls are free to rotate. The thread form on the rolls must be truncated and effectively cleared in accordance with normal ring gage practice. "Go" gage rolls should be at least as long as the thread to be checked, otherwise the thread lead will not be properly gaged. "Not Go" gages should check only one thread at a time. As with internal rolls, snap gage rolls can be made to check 60° form, Whitworth, acme, buttress, and other special forms. The thread form is ground annular rather than to the helix angle, hence the rolls cannot be successfully applied to threads having a large helix angle (7° or greater) or to multiple threads.

Gages of this design will afford sufficient accuracy for most production applications, however they must be specified with consideration for their shortcomings. When specified for large-quantity applications, it is good practice to supply also a thread ring gage for spot checking. This may also be accomplished with an optical comparator or by measurements across wires.

Gages for special thread forms are of the same general design as gages applied to 60° form threads. Design data for acme, buttress, Whitworth, straight pipe, and square threads are available in "Screw-Thread Standards for Federal Services," mentioned earlier. Designers are cautioned to check whether standard tables have been used to design the part, otherwise development of special design data may be necessary.

Multiple threads are defined as those having a lead which is two or more times the pitch. Generally, gage design data used for single pitch threads will apply to these as well. Gage components having annular grooves are rarely usable as the helix angle

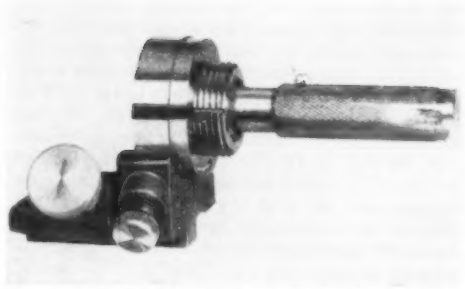


Dial indicator snap gage mounted on gage stand provides differential measurement of product vs master setting plug and simplifies work handling for operator

is too steep. "Go" ring or plug thread gages may be used which are the complement of the thread to be checked. "Not Go" gages should have a single thread and each thread in the multiple be tested individually. For greater accuracy, "Go" single-thread gages may also be used on each start first, and then a final check performed with a multiple thread gage.

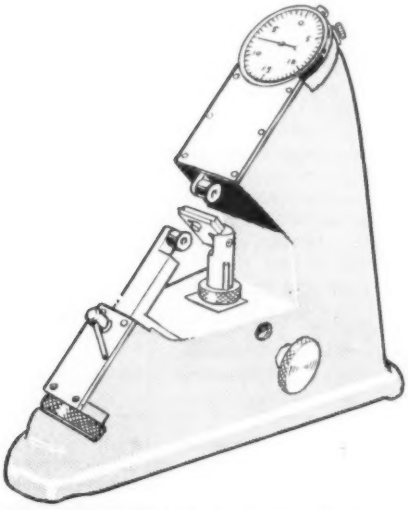
Taper pipe threads differ from the standard threads in that they are cut on a conical rather than a cylindrical surface. The thread centerline is perpendicular to the part axis and therefore one flank of the thread is longer than the other. Pipe thread gages are both "Go" and "Not Go." Steps determine the distance which the ring gage goes on the external thread or the plug gage enters the hole. The distance between steps is the tolerance on the pd expressed as a function of the taper. This gaging can be functional only and will not check characteristics of the threads, except their assemble-ability. As the pipe thread is cut on a taper, the male and female members will bind when completely assembled. Precision pipe thread (Dryseal) must be carefully checked to insure maximum contact between mating surfaces. This requires six separate gaging steps.

One particularly popular method of checking pipe threads is the "Tri-Roll" taper thread gage. It was developed to determine the accuracy of every element in a taper thread. It checks for lead, diameter, thread form, and taper. Gage operation is similar to that of a ring thread gage, as work must be screwed into. The "Tri-Roll" somewhat resembles a roll snap gage except that it contains three rotatably mounted annular gaging rolls spaced 120° apart. Adjustment is provided by means of an eccentric pin. The combination Tri-Roll gage brings together the functions of Tri-Roll thread and plain taper gages. A complete functional check for thread form, taper, lead, major and minor dia, pd, and other elements can be obtained with one gage.

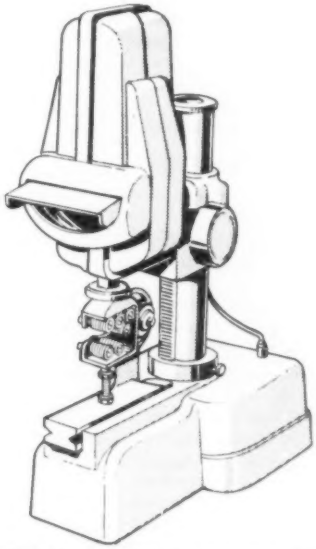


Taper pipe thread staging fixture is used with optical comparator to position part. Plug gage serves to align shadow pattern

Setting-plug thread gages are the basis for all gage adjustments except some optical instruments. They are required for the manufacture, acceptance inspection, subsequent surveillance, and adjustment of solid and adjustable thread rings, roll thread snaps, segment snaps, Tri-Roll gages and most indicating gages. For the larger threads, 2½ in. or more, setting bars are sometimes used. These are less clumsy and can be adjusted a few thousandths either



Indicator gage for pd check is similar to roll snap gage but provides wider size range. Most thread gage rolls have annular grooves, hence are not suitable for lead angle over 7°, or multiple threads



Visual comparator combined with roll snap gage to provide very accurate differential readings at rapid pace. These gages can be used with thread measuring wires or set to gage blocks as well

way. Setting plugs and bars usually are provided with a truncated thread. They should never be used for checking parts, not even for spot checking.

As a result of equipment limitations in many shops, thread rings having minor diameters under 0.375 in. cannot always be measured. To overcome this, two plain plug gages are usually used to inspect the limits of the ring or segment gage minor dia on the "Go" and "Not Go" principle. Plain plug and ring gages are always useful to check major and minor diameters and will simplify threading problems considerably if used before threads are cut to determine that sizes are correct to start with.

Indicating Gages

Gage design starts with the plug gage, proceeds to the ring gage, and from that come the various snap gages. Thus far, all have been fixed gages, checking by attributes. As soon as an indicator is placed on one arm of a snap gage and one segment or thread roll is placed on the indicator spindle, a variable is introduced. Thenceforth the operator is using an indicating gage. Many gage styles have been developed from this technique. No longer is the answer just "yes" or "no" (and sometimes "maybe"), but instead it is "yes" or "no" and to what extent. The snap gage and indicator (or comparator for greater precision) combination is used for checking parts in production lots. Units are usually mounted in bench-stands which are designed for that purpose.

Optical comparators can be used to measure elements or to check composites in a functional sense. Charts are available for either purpose or can be drawn for special requirements. Dial indicators can be used in conjunction with the comparator to measure variations from the standard pattern. Fixtures can be built which will permit fast set up of parts on the comparator stage. However, caution must be exercised as for some kinds of work, the sight is not as sensitive to errors as the sense of touch, but this is rare. Optical methods are extremely versatile.

GAGE CONTROL

As gages provide no positive measurement, yet are the sole judge of product acceptability, a system must be provided to assure gage accuracy. This system must be carefully organized and strictly adhered to, or the value of gaging is entirely lost.

Because gages wear with use, or lose their original settings, each active gage must be checked against masters periodically, with the frequency of inspection determined by the rapidity of wear on the gage. Thus, the person in the inspection department responsible for standards should have on file in the tool crib a record card that shows when each gage was last checked and condition at that time. From this the wear rate can be determined and the inspection period fixed.

A second card index file is then set up to insure that gages are inspected at proper frequency. These are called "call-up cards" and are indexed according to the dates on which gages are to be brought in for inspection. Cards for gages to be inspected daily, weekly, every two weeks, and monthly are filed according to the days of the month; cards for gages to be inspected every three months, six months, or only once a year are each grouped separately. As an additional precaution, all gages are color-coded to indicate the inspection frequency and tagged to show the last inspection date. Call-up cards returned to these files after a gage has been inspected and accepted for reuse are filed behind the tab card for the date of the next inspection. In the larger plants, gages are inspected by one group of people only. Any resetting that is necessary is done by a separate group. Thus, delays in returning usable gages to the production floor are avoided.

Each day the gage record clerk draws out the call-up cards for gages to be inspected the following day. Gage numbers then are listed on a "gage inspection requisition," the original of which is sent to the leadman or foreman. He has the gages delivered to Inspection the following morning, drawing replacement gages from his tool crib and returning the shop file copy of the gage record card. He retains his copy of the requisition as an indication of gages out for inspection. All gages not returned by the shop are entered on a "delinquent" list by the Inspection clerk. The gage, together with all three cards (control, call-up, and requisition) is given to the inspector. Satisfactory gages are returned to Production. Unsatisfactory gages are sent to another group for repair or replacement. After making suitable entries on all three cards, the inspector returns them to the clerk for proper filing.

Good gaging practice is not difficult to learn, but it does require common sense and good judgment. Gages and parts should never be forced together, nor should the contacts on indicating gages be applied to work with too much pressure. Gages should always be treated as though they were precious, the user remembering always that they are as valuable as all the pieces that may be wrongly rejected or accepted if the gage is damaged. By following a few simple rules, all the parts accepted by gages will assemble with their components.

WE APPRECIATE the valuable help provided by the many manufacturers and users of thread gaging equipment. Lack of space prevents our listing the individual contributors, but the previous report (Oct. 15) does contain the complete list.

Our Defense Program Faces a Crisis

A major crisis will soon confront our defense program.

It is not a crisis in raw materials. To find enough materials, from steel to cobalt, for defense production is a serious problem. But it is one that is being solved.

It is not a crisis in manpower. Shortages of workers with special skills hamper production, but these shortages are being relieved, slowly.

It is not a crisis in manufacturing capacity. American industry's record-breaking expansion is, with very few exceptions, keeping abreast of defense needs.

The coming crisis will be one of finance. It will rise from our failure to provide the means to PAY FOR the defense program we now have under way.

A $15 Billion Deficit?

Congress has approved a defense program which is scheduled to raise *total* federal spending in the year from June, 1952, to June, 1953, to somewhere between $85 and $90 billion. Additional appropriations for more air power and atomic development, which are now proposed, would add several billion dollars.

But Congress has not approved a tax plan to match such spending. With the new levies enacted in this session, tax collections during the 1952-53 fiscal year are estimated to fall somewhere between $70 and $75 billion. That would be roughly $15 billion short of balancing the budget. If the defense program is expanded, the deficit will be that much greater.

We have not yet felt the impact of the crisis that would accompany a federal deficit of this magnitude. Federal tax collections currently are big enough to balance federal expenditures. But the defense program is scheduled to boost the annual rate of federal expenditures $25 billion in the next year.

To Meet the Crisis

By January the crisis will be clearly in sight.

Then the President will present his budget. After that, Congress must act to close the broad gap between government income and government spending. If it fails to do that, the whole defense program will be menaced by weakness in its financial foundations. That weakness might well take the form of another destructive wave of inflation.

We have three ways to meet this crisis.

The best approach, of course, is to cut unessential expenditures. That can make a real dent in the deficit. The second is to collect more

taxes. The third, and by all odds the most dangerous, is to have the federal government meet its deficit by going deeper into debt. Borrowing, which might feed inflation, can easily lead to disaster.

Near Income Tax Limits

It will not be possible to raise taxes to meet the deficit merely by increasing further the rates on corporations and on persons in the upper income brackets. Congress has about scraped the bottom of that barrel.

The Senate Finance Committee said as much in reporting this year's tax bill. The Committee reported that it had "serious doubts as to the feasibility of raising any substantial additional amounts of revenue from income tax sources." The Committee observed that recent tax legislation brings the burdens of most corporate and individual income taxpayers close to the World War II peaks, and actually carries the rates paid by many taxpayers above those peaks.

Our ramshackle federal tax system must be thoroughly overhauled in order to broaden the tax base if it is to produce more revenue—without doing much more harm than good.

The shocking fact is that no one seems ready to act along any line that might enable us to surmount the crisis.

That fact of itself aggravates the coming crisis. And next year's presidential election doesn't make it any easier to move effectively. Both parties will shrink even more than normally from backing any program that might irritate any considerable number of voters.

If we are to meet this crisis on the tax front in an orderly way, the technical work should be in progress right now. To a large extent it is being ignored.

If we are to enforce the vitally essential program of government economy, there is the same urgent need to get under way the spade work that is required.

And if—as a last miserable expedient—we decide to let the federal government drift deeper into debt, it must have a well-developed program of borrowing from individuals and other investors, such as insurance companies, rather than from the commercial banks. Borrowing from commercial banks might speedily translate the deficit into more and more price inflation. No adequate program of borrowing from savings is now in sight.

Now Is the Time

It is possible, of course, that international relations may improve sufficiently to make it safe for us to slow down the rearmament program. If that should happen, the fiscal crisis would not be so critical. But that kind of good fortune has been notably absent in recent years.

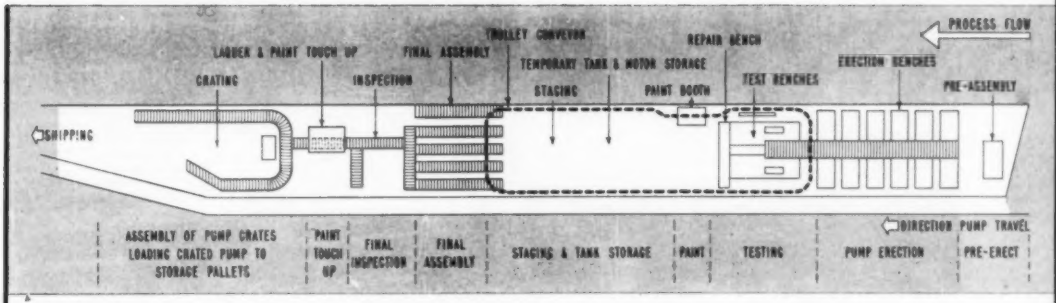
Lenin, patron saint of Communism, is quoted to the effect that to destroy a political and social system such as ours "you must debauch its money."

We shall set democracy to digging its own grave if, through our preoccupation with politics during the presidential campaign, we pave the way for further debauchery of our money.

If we really want to avert that disaster, now is the time for us to get going.

Once the crisis is full upon us, it will be too late.

McGraw-Hill Publishing Company, Inc.



New layout contains nine major areas in which like operations are performed on all models. Conveyors perform the majority of handling operations, with banks of work maintained between areas to iron out unbalance among different models. New method replaces former plan in which pumps were built progressively along single straight-line conveyor. Method represents departure from normal concepts of jobbing production

CONVEYORIZED COORDINATED ASSEMBLY SPEEDS JOB-LOT PRODUCTION

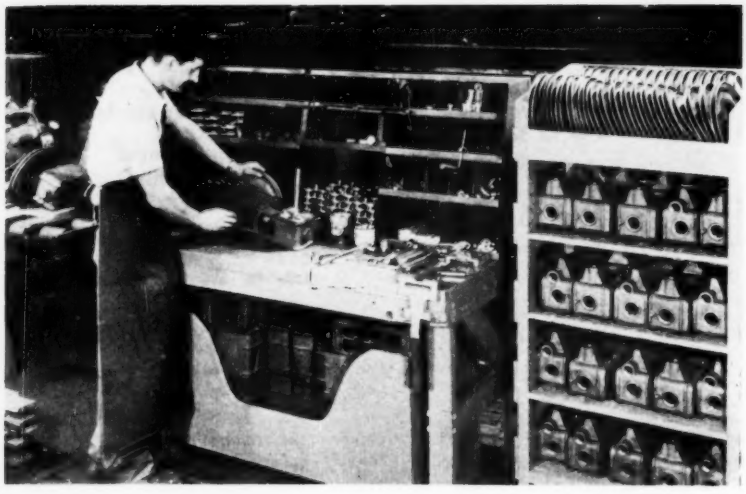
Double production from 20% less space and with 25% less manpower has been obtained from a conveyorized layout designed particularly to solve the problems involved in assembling small lots in many different models

BY LOUIS WOZAR, Vice President and Associate General Manager
DAYTON PUMP & MFG. CO., DAYTON, OHIO

To solve our problems in assembling small lots of many different models, we installed modern conveyorized coordinated assembly methods. Work now moves to assemblers in a continuous flow, preventing bottlenecks and requiring the assemblers to give full time and attention to their work. Operations have been improved and waste of manpower through loss of time waiting for parts has been practically eliminated. As a result, we now get greatly increased production of improved quality with 25% less manpower than formerly was required.

Major features of our new system are: Assembly has been broken down into nine major areas corresponding to the natural operational breakdown in the assembly process. For example, one major operation is pump erection, another is testing, a third final assembly, and so on. Work completed in each area feeds into a work bank that supplies the next area. Within areas, each assembler builds a complete pump assembly instead of adding units to a partially completed assembly that has been passed to him. All assemblers build all models—not just one or a few models. All parts needed by the assemblers to build a specific quantity of pumps are at his fingertips in bins on his workbench. Bins are, when necessary, filled by stockroom attendants.

This basic plan of assembly was adopted only after careful study of our requirements. Our production consists of two lines of water pumps — reciprocating and jet, some with tanks and some without, some painted and some galvanized. In all, there are 60 models and 400 major components—none interchangeable in both lines, or even in all models in one line. While production is of a jobbing nature, erection is interspersed with testing and painting operations. In our old method of assembly, we had attempted to set up a production line partly coordinated by a gravity conveyor covering all processing from pump erection through final crating operations. Under this method manpower was wasted for several reasons: first, running several dif-



Pump erection is performed along gravity roller conveyor. Each assembler builds complete pump and can build any model. Nine different pumps can be built simultaneously, and production of each man can be checked for incentive payments. Pumps move toward background into work bank ahead of testing

Modernized bin-bench has been planned for ease of work motions and for orderly storage of all material required to build as many as 50 pumps. Arrangement also simplifies checking of material by stock man who provides all parts required for order

ferent models during the day created an unbalance in manpower on the line when pumps with different operation sequences were processed. Second, as material control was poor, parts shortages frequently occurred, holding up operations and often necessitating temporary storage of incomplete apparatus at various stages of assembly. Third, manpower could not be balanced properly as processing times were not known and control of individual efforts was not possible.

To overcome these problems the new assembly method was developed. Because of the testing and painting operations, we could not adhere to the normal concept of jobbing production. Therefore, we decided to setup the major operational areas, and to tie them together with conveyors that feed a controlled production bank between operations.

Conveyors Tie Areas Together

Nine natural operational units were established as shown on the layout. Each is provided with the necessary facilities for maintaining a flexible balance of manpower on the entire line. In two areas—pump erection and final assembly—gravity roller conveyors move parts from one operation to the next. Tieing the two areas together is a trolley conveyor that provides space beneath for storage and the staging of major parts for final assembly operations. This same conveyor also moves pump assemblies through the testing and painting area. Not only has a great deal of manual handling been eliminated in this way, but stock control and production scheduling also are greatly simplified.

Painting is performed as pumps move by on trolley conveyor. Pumps rest on same pallet used on roller conveyor in erection area. Assemblies move to rear into work bank ahead of final assembly

Final assembly brings together tanks, moving in on special trucks from staging area, and pumps, moving in on trolley conveyor from work bank after painting. Staging area provides operational flexibility that makes it unnecessary to predetermine production schedules to match tanks and pumps for final assembly

Our new system gives us several other important advantages:

1. It enables us to check the ability of each individual workman and to measure the effort he extends. Thus, it makes a wage-incentive system possible.

2. It gives positive material control by supplying parts directly from stock in bins that have been specially designed to coordinate with the assembly operations.

3. It permits scheduling assembly work weeks in advance.

4. It supplies the cost department with production information, faster, in more detail, and with greater accuracy than formerly was possible.

5. It has eased the task of supervision so only one supervisor now is required as compared to three under the old setup.

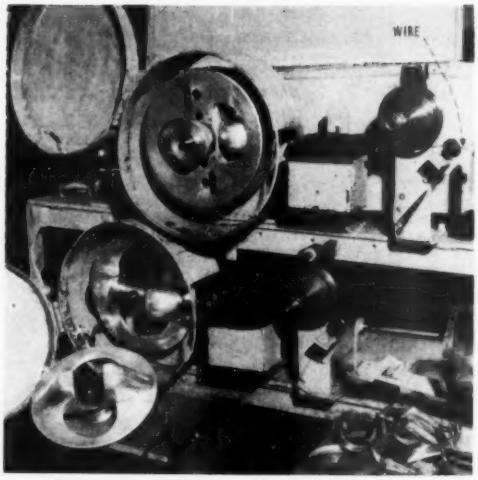
6. It is designed and laid out so it can be extended when required to provide increased production.

7. The system can be employed to assemble new, different products that involve small-lot assembly and require fairly similar assembly procedure.

Thus, while our production is essentially job-lot, we have been able to employ conveyorized handling, and this, in conjunction with other modern management techniques, such as incentive pay, advance production scheduling, and tight control over material both on the line and in the stockrooms, has enabled us to make much more effective use of two of the most expensive elements in production —building space and manpower. At the same time, scrap and rework charges have been slashed and production quality improved.

OLD METHOD of producing coil required five steps: (1) wind flat; (2) first form; (3) second form; (4) bake; (5) final form

NEW METHOD of winding coil to approximate shape eliminates two forming operations. Coil now is wound (1), baked, and finish formed (3)



1 Form-winding machine runs at 1600 rpm to produce shaped coil for Crosley television sets. Wire feeds from spool at right (not shown) through guide rolls, over sponge soaked with solvent, and onto special mandrel. Each mandrel winds one coil at a time to the approximate curved shape required for the deflection yoke assembly of television receivers

45% reduction in cost of deflection yoke assembly for television sets is obtained when...

THIS SPECIAL MACHINE

BY J. W. WHETSEL, Process Engineer
CROSLEY DIV., AVCO MFG. CO., CINCINNATI, OHIO

ONE of the most important components in television receivers is the deflection yoke. Fundamentally, this consists of two sets of coils whose axes are at right angles to each other and to the axis of the picture tube. Its function is to deflect the single electron beam and the vertical and horizontal plane until a normal rectangular and undistorted picture is presented to the viewer.

Initially, Crosley purchased yokes from outside suppliers. However, early in 1949, it became apparent that currently existing commercial facilities would not be able to keep pace with the rapidly expanding television industry. Crosley management, therefore, decided to set up their own facilities for the production of yokes.

During this period, picture tubes were the round 52° type. This design was analyzed carefully, and a successful method of production was developed. Major operations included winding the coils in flat oval form on a standard winding machine, shaping them in three die-forming operations, and assembling them into a finished yoke. Yokes were produced in quantity by this method at a saving of approximately 10% over the purchased cost.

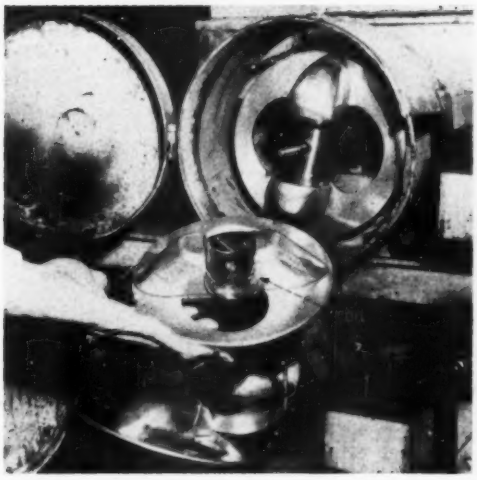
When the new rectangular tubes with 70° deflection angle were introduced, however, it then became necessary to develop a new deflection yoke. Prior to setting up the production of this yoke, an investigation was made throughout the industry to find better methods of manufacture. This study revealed that winding coils to shape was being done commercially. Through the courtesy of one of our wire suppliers, we were permitted to view the operation and subsequently developed machines for this method of winding.

How the Machine Works

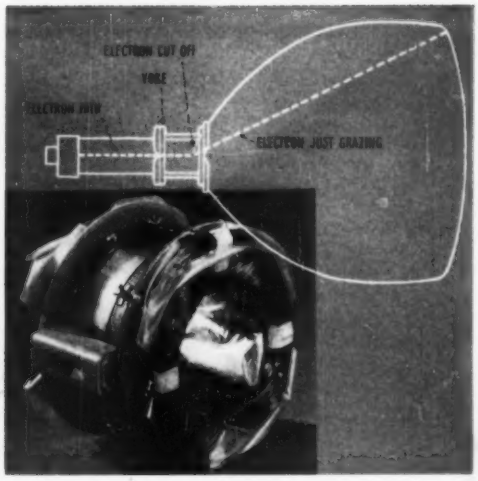
Our machines operate at 1600 rpm and wind two coils at once—one on each mandrel. This high speed is necessary for the wire to follow the mandrel forms properly. Under the old method, the machines ran at 450 rpm.

To start the coil, the operator wraps one turn of wire around the mandrel and secures it to a clip on the outer plate. During winding, the wire is thrown back and forth to follow the contours of the knobs on the mandrel. These are developed forms and their shape is critical to the success of the operation. Becaue of the high speed of the machines and the diameter of the mandrels, the mandrels are made of aluminum, hand polished to eliminate any possible wire hang-up on the forms.

The reciprocating motion of the wire is the only



2 Winding mandrel has smooth contoured knobs to lay wire into coil of desired form. Shapes are developed forms made of hand-polished aluminum



3 Deflection yoke assembly contains four form-wound coils. Mounted on picture tube (as shown in sketch), assembly deflects single electron beam in vertical and horizontal plane, so normal rectangular and undistorted picture is presented. Assembly is shown without case

WINDS COILS TO SHAPE

tension required in winding coils to shape. While the coils are not completely dry when coming off the mandrel, no difficulty is encountered in handling. A light film of oil is applied to the mandrel at approximately every fifth coil. This is to eliminate cleaning or washing mandrel contours.

The wire is 0.0100 in. dia on the vertical coils and 0.0142 in. on the horizontal coils. It is insulated with a baked-on synthetic resin to which a plastic coating has been applied. As the wire feeds onto the mandrel, it passes through a wick-action impregnated felt containing Menthyl Cellosolve. This solvent causes tackiness in the plastic coating in the wire and results in a coil with good adhesion between the wire layers. However, as the solvent action causes some crazing in the plastic coating, the coil is passed through an oven with temperature controlled at 125 C immediately after winding. This 5-min. baking cycle performs three functions: It drives off the solvent, closes the crazing, and softens the plastic coating in preparation for a die-forming operation that brings the coil to exact size and shape. Forming is performed in water-cooled dies in electrically-controlled air-operated presses. Cooled dies set the plastic coating, providing a coil that is extremely hard and firmly set in shape. Leads are stripped and the coil then is ready for assembly into a finished yoke.

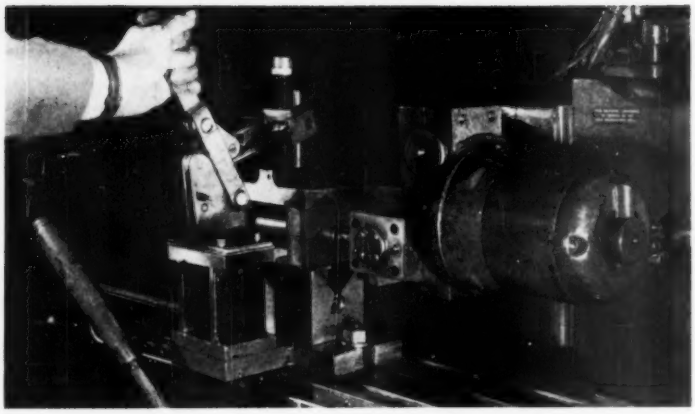
Development of the new winding method eliminated two of the forming operations previously required when coils were manufactured by the method first developed. This not only reduced direct labor costs on the job but also virtually eliminated scrap and defective work. It had always been difficult to avoid damaged insulation and shorted coils when coils were found flat and then formed to final shape.

Design Also Was Improved

However, improvements that permitted lower manufacturing costs also were made in the design of the coil itself. Actually, from the time the coil-winding program first began in the Crosley Division, a great deal of development work was done with the engineering department to develop the shape and form of the coil to eliminate neck shadow, pin cushion and barrel distortion. This was highly essential to provide the viewer a television presentation with a full and undistorted picture. This work also permitted simplification of the yoke assembly procedure.

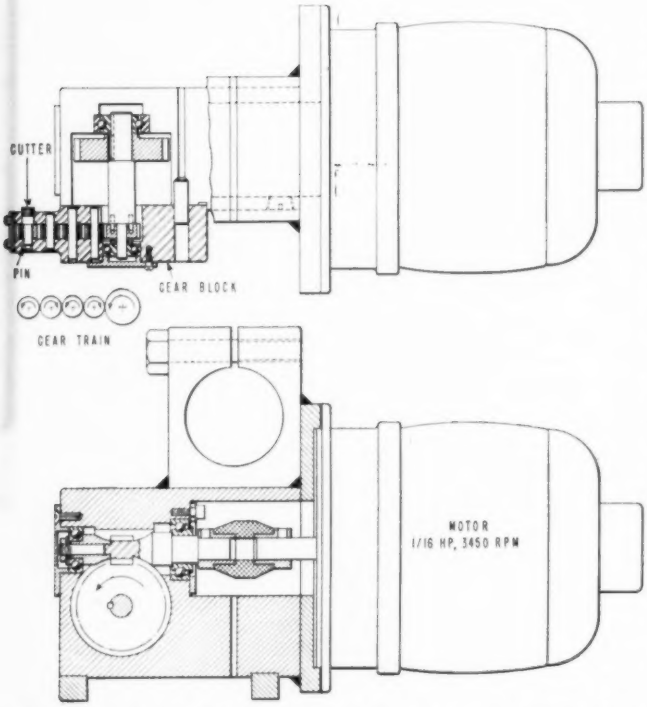
As a result of the manufacturing economies realized from the new form-winding method, as well as those obtained from process improvements made possible by design changes, the new yoke is produced at a saving of approximately 45% of the cost of a comparable component.

By SIGURD K. RUDORF
Superintendent
Maintenance & Tools Section
General Machinery Div.
Allis-Chalmers Mfg. Co.



Miniature milling head devised by Allis-Chalmers tool engineers to cut blind keyways in bushings for a line of centrifugal pumps. Smallest head in series will enter bores as small as 0.875 in. in dia for cutting 3/16- and ¼-in. wide keyways

HOW TO MILL BLIND KEYWAYS



Powered by a 1/16-hp, 3450-rpm motor, this miniature milling head will enter bores as small as ⅞-in. dia to a depth of ¾-in. Depth can be increased by extending gear block and adding gears to the cutter train. Solid construction of gear block insures adequate support for the cutter spindle and gears

CONSTRUCTION of special end-milling heads which will enter small bores to cut blind keyways is usually a difficult task. Allis-Chalmers tool engineers recently had to solve this problem when design engineers specified blind internal keyways in bronze and stainless-steel bushings with bore sizes as small as 0.875-in. dia for a line of centrifugal pumps. Internal leakage problems made it necessary that the keyways be blind, and without drilled relief holes which would have permitted shaping or slotting.

Two small end-milling heads are shown for use on Nichols hand millers when machining these keyways. The smaller head is designed to enter a 0.875-in.-dia bore to a depth of ¾ in. and cuts 3/16 and ¼-in. wide keyways, using two-lip HSS cutters. The larger head will cut keyways 0.250 to 0.875 in. wide in larger bores.

Because of the delicate gearing (0.500-in. PD, 16 teeth, 14½° PA) used in the smaller head, it was decided to provide a separate motor, selected to limit the torque which could be applied.

Simple helical gearing is employed in the drive from this 3450-rpm motor to the 862-rpm countershaft. Conventional spur gears in

• Miniature heads, attached to a hand miller, solve an internal milling problem. Space limitations preclude use of bushings, but steel-on-steel bearings prove satisfactory

sufficient number to provide the necessary "reach" are then inserted into a rectangular slot in the gear housing. The last gear in this train has an internal keyway which engages a key pressed into the shank of the cutter. This construction makes it unnecessary to split the block which carries the gears, thus adding greatly to the rigidity of the head assembly.

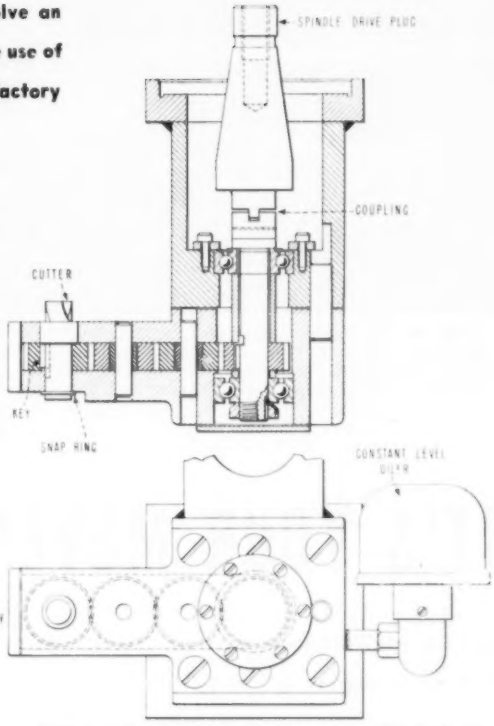
On this head, cutter size, in relation to the body, is such that satisfactory sleeve bearings could not be used. It was therefore decided to make the body of Timken Graph-Mo graphitic steel (hardened to 58-60 R_c) and run the cutter (63-65 R_c) directly in the body. While there was some concern over this construction, it has worked to our entire satisfaction over a period of several years.

The oiling system undoubtedly contributed considerably to the long life of the head. The gear case or body is fitted with a constant level oiler, and the gears have tangential grooves in their side faces so a small amount of oil is pumped through the entire gear train and out through the slight running clearance between the cutter and the body. The constant level oiler replenishes the slight oil mist thrown off by the cutter.

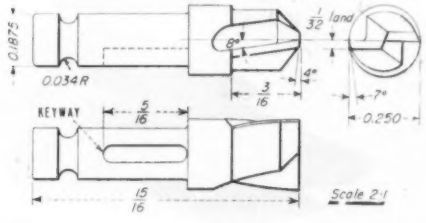
This small head has repeatedly driven a 0.2500-in.-dia cutter to destruction in stainless steel without damage to the head. Occasional gear failures have been experienced, but these are of minor importance and are easily repaired.

Construction of the head was not difficult, heat-treating distortion of the gear center bores being corrected by jig-grinding after hardening. The hardened rails shown at the bottom of the head were provided to facilitate setting the head level with the machine table when suspended from the overarm of the machine. This construction has proved helpful, because setups are frequent.

A similar, but more substantial, head is also shown. It is designed to enter a 1⅞-in.-dia bore to a depth of 2¾ in. In this case, the drive was taken directly from the milling machine spindle, because the head has adequate torque capacity to stall the motor. Although it might have been possible to incorporate sleeve bearings into this head, the excellent results experienced with the smaller unit led to the continued use of Graph-Mo and HSS mating surfaces. In the large head a snap ring is used to retain the cutter. Wherever space permits, this is more satisfactory than the pin and groove lock which space limitations forced us to use in the smaller head, and makes cutter changing easier.



Similar in basic design to the smaller head, this head will enter a 1⅞-in.-dia bore to a depth of 2¾-in. It is driven by the milling machine spindle instead of by separate motor

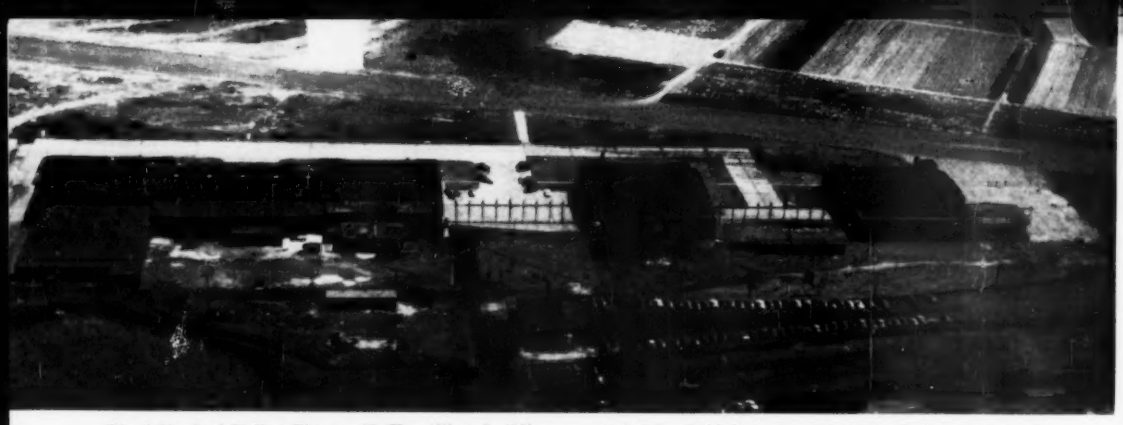


High-speed steel cutter for small head has annular groove in shank for pin used to lock it in drive gear body. Cutter speed is 1293 rpm. Cutters for larger head have 0.624-in. shanks and are held in place with snap rings

Heat-treatment of the Graph-Mo bodies was: Harden at 1450F, and quench in oil; temper at 600F to 58-60 R_c.

Cutters are made from 18-4-1 HSS hardened to 63-65 R_c and ground all over. The smaller head uses two-lip cutters with 0.1875-in. dia. straight shanks having 0.064 x 5/16-in. keyways in one side for driving.

Cutters used in the larger head have 0.624-in.-dia shanks with 3/16 x 9/16-in. drive keyways. They may have 2, 6 and 8 flutes, depending on cutter size. All cutters are left-hand helix, left-hand cut, with 8 to 10° helix angles. The 1/32-in. lands along the cutting edges have 7° radial relief.



Plant No. 2 at Valley Stream, N. Y., utilizes buildings, originally hangars, which were partially converted for manufacturing during WW II; have been used for storage purposes only since 1947. Main building was created by bridging concrete apron between two adjacent hangars and adding a wing at the rear of one section. Grounds provide ready access and plenty of room for employee parking; allow for expansion

IT'S YOUR MOVE!

Are you moving to new or larger quarters? Perhaps you will someday, and we thought that telling you how Fairchild did it might ease your problems. Planning is important

BY ERIC PREECE
Works Manager
Fairchild Engine Div.
Fairchild Engine & Airplane Corp.
Farmingdale, N.Y.

RAPIDLY increasing demand for the many aeronautical products manufactured by Fairchild required that we considerably expand our facilities. To do this within the original plant space was impossible, would seriously cramp present production operations. A second plant had to be found. It would be preferable if this were close enough to the main plant to be convenient, yet far enough away to provide a second source of labor.

Long Island industrial growth being what it is, there are very few standing buildings, with large open bays suitable for heavy manufacturing operations, available for quick occupancy. Many firms are now building on Long Island, but we needed the space more quickly than building would permit.

One of the few places to meet most of our requirements was rather unusual. It consisted of two airplane hangars with the apron between them enclosed and joining them to form one large single-story building. In addition, there are two single hangars adjacent and separated by aprons. These are located at the historical Valley Stream Airport in Valley Stream, N. Y., about 20 miles west of our main plant. The airport has been closed to air traffic, and the hangars were used, until shortly after World War II, by a firm building aircraft. The property is owned by the government, and since the other firm moved out the buildings have

Capable machinery haulers and riggers are very important to a successful move. They have a knack for juggling heavy equipment which only comes from experience. Six trucks were used to move our jet-engine-compressor line in two days. Total weight of equipment was more than 300 tons

MASTER PROGRESS CHART—VALLEY STREAM PROJECT

Construction and Machine Installation

TARGET DATE, MAY 15

ITEM NO.		DESCRIPTION	MARCH 2	9	16	23	30	APRIL 6	13	20	27	MAY 4	11	18	25	JUNE 1	8	15	22	29	JUL 6	13
1		**Recondition Roads, Parking Lots & Grounds:**																				
	A	Parking Lots			S	25	100	★		F												
	B	Roads			S		100	★		F												
	C	Fences					S				F											
	D	General		S			10	15										F				
2		**Clean-up Buildings:**																				
	A	Remove Surplus Materials			S		2	30	60			F										
	B	Remove Surplus Equipment			S			10	60					F								
	C	Sweep Out			S		5	20	70						F							
3		**Building Alterations:**																				
	A	Fill in Pits					S	25	75		F											
	B	Tear Down Masonry Partitions																				
	C	Erect Partitions																				
	D	Construct Ramp To Receiving Area				S		5	100	★	F											
4		**Building Repairs:**																				
	A	Roofs															F					
	B	Replace Glass				S	2	5	15													
	C	Waterproof Exterior of Building 3A						S			F											
	D	Repairs To Doors				S	5	10	12					F								
	E	Factory Floor					S		5			F										
	F	Office Ceilings																				
5		**Painting:**																				
	A	Exterior Trim & Doors	S	2	5	7	10	10													F	
	B	Interior - Main Manufacturing Area				S	10	25			F											
	C	Service Areas																				
	D	Offices		S	1	2	5	10									F					
6		**Recondition Plumbing:**																				
	A	Water Lines, Valves & Fittings				S	2	5	15						F							
	B	Drain Lines, Valves & Fittings				S		3	10						F							
	C	Sewage Lines					S	3	10		F											
	D	Toilet Facilities					S	5	15				F									
	E	Sewage Disposal Plant					S	3	20						F							
7		**Recondition Heating:**																				
	A	Open & Inspect Boilers	S	25	70	100	F★															
	B	Clean & Hydrostatic Test				S	10	30	70													
	C	Repair Steam & Cond. Lines, Valves, Fittings				S	2	5	25					F								
8		**Recondition Electrical Systems:**																				
	A	Check Out System			S	3	8	10	30					F								
	B	Repair Wiring, Boxes, Fittings, Etc.					S	5	30					F								
	C	Repair Light & Replace Lamps				S	8	10	15					F								
9		**Install Electric Power:**																				
	A	Procure Transformers	S					100	★					F								
	B	Procure Distribution System	S												F							
	C	Prepare Plans & Specs for Installation	S	25	40	70	90	100	F★													
	D	Install Trans. & Power Distribution System								S									F			
10		**Installation Compressed Air System:**																				
	A	Procure Compressors	S									F										
	B	Prepare Plans & Specs for Installation				S		30	50		F											
	C	Install Compressors & Connect Air Mains								S					F							

Estimated start and finish, or delivery on equipment, are indicated by "S" and "F." Actual percentage of completed work is shown by figures. Star indicates job finished. Chart is shown as of week of April 6. It can be seen that transformers were received before they were expected, whereas compressors and handling equipment did not arrive as planned. Items such as painting and general repair of roads and grounds, plus details of layout, could be completed after production line was in operation. Starting of some items was contingent upon completion of others. Control is as important as for production operations

been largely vacant, except for storage purposes.

Here is a substantial building, with floor space to meet our needs, in a pleasant and cooperative community. It provides plenty of outside space for storage and employee parking as well as an effective security outlook. The other hangars are available for planned expansion as tools become available. Some manufacturing has been done here before.

The buildings were assigned to Fairchild in February, 1951. We had already decided that it would house our entire production line for front and rear compressor frames used in the General Electric J-47 turbojet engine.

Our first step was to assign our plant engineering department to the task of making a complete survey of the grounds and buildings, then to report all findings, make recommendations, and oversee the reconditioning and installation operations. On a bid basis, they immediately contracted for the services of roofers, painters, carpenters, riggers, masons, etc. These people joined our own plumbers, steamfitters, and electricians in determining the work required. Then their efforts were coordinated to estimate the time, materials, and cost for each phase. Upon completion of the estimates, they were discussed with Fairchild management. Mutual adjustments were made and the go-ahead was given. Most estimates were complete by March 15. Plant layout, electric power layout, and heating were started March 1.

Our production schedule demanded that parts to be manufactured at Valley Stream (Plant 2) be in work by June 15. To be on the safe side, we set our completion target date at May 15. Based on

At home in the kitchen, the women too had a big job in readying the existing equipment, plus the new culinary tools, for the "hungry horde." They were open for business on the day the new line started

IT'S YOUR MOVE continued

this date, we set up a "construction and machine installation progress chart." The chart was divided into weeks from March 2 through July 27 and contained a list of all essential items.

1. Recondition roads, parking lots, fences, and grounds
2. Clean up all buildings
3. Building alterations
4. Building repairs
5. Painting
6. Repair, replace, and recondition plumbing
7. Repair, replace, and recondition heating
8. Repair, replace, and recondition electrical systems
9. Install additional electric power equipment
10. Recondition existing compressed air system
11. Install additional compressed air capacity
12. Construct scrap bins
13. Repair and improve factory ventilation system
14. Install office and cafeteria air conditioning
15. Recondition cafeteria
16. Install overhead handling system
17. Prepare plant layout—move manufacturing facilities—equipment, materials, and supplies
18. Hook up newly installed machines

Of course, the order in which these functions were listed is not intended to convey any indication of priority. Most of the many jobs were started at about the same time, except for those items which were contingent upon the completion of another item. Crew assignments for each job were based on the manhour estimates for that job and the normal working hours available to the target date. Our own purchasing department handled most of the purchasing and expediting of equipment.

Each section head provided a weekly progress report on the activities of his group. This report was posted on the master progress chart in the office of the person in overall charge of the project. Constant control of the operation was thus available with a minimum of checking.

In April we sent questionnaires to, and personally interviewed, each of the men working on the line to be moved. Our purpose was to discover whether they preferred to work in Farmingdale or at Valley Stream. Most of the men lived between the two plants or near the new plant. A few men lived east of Farmingdale, an inconvenient distance from Valley Stream. Where it was convenient for them, we transferred the men to the new plant; otherwise we found equivalent jobs for them in the main plant. In some cases, employees in other departments who lived close to Valley Stream were transferred to that group. Simultaneously, we set up an employment office at the new plant to interview and recruit the additional help that would be needed. New employees were oriented at the main plant.

All of the machines were numbered, a floor layout was made, and then each machine was spotted on the floor of the new building by its number. Location and position were shown. The move sequence was planned by operations to permit smooth starting of the operation sequence as soon as the machines were in place.

Our master progress chart indicated that Plant 2 would be ready to receive the machinery by Friday, May 25. We notified the Centre Trucking Company, briefed our own men on the plan and sequence, and "H-hour" had arrived.

Moving Day

The move started at the shift end on May 25 and proceeded around the clock. Machines were disconnected as operations were completed and, with tooling intact, were moved out to the trucks. Machines were moved by the trucking company, and miscellaneous equipment such as benches, lockers, hardware stores, and material was moved by our own trucks and personnel. By 8:00 AM on Monday, May 28, the line was in operation at Valley Stream, and at noon the men had lunch in the reconditioned cafeteria. The move was complete by Tuesday, with no appreciable loss in production time.

Although this move was not a large operation, it provided most of the usual problems and a few unusual ones. We also obtained a useful evaluation of our own methods. For any move to be efficient, it should have:

1. Careful, detailed advanced study
2. Thorough planning, scheduling, and sequencing
3. Full cooperation and coordination of all concerned

ROUND TABLE

Power of Suggestion

"Don't tell me you're filling in a suggestion blank, Ed! Have you looked at the eligibility rules on the back of the blank? You're part of management—so your suggestions are no good if they apply to your department."

"What do you mean, Al? This is an idea that would be beneficial to all my boys—and to others all over the plant. Why shouldn't I get a few bucks for the idea, what with Christmas bills and all?"

"Read right there, Ed: 'Supervisors will receive consideration for awards only on suggestions which clearly fall outside their line of duty. Awards to such employees will be made only on suggestions effecting savings in *other* departments.' That word 'supervisors' means us and assistant foremen. Apparently our pay covers ideas rather than physical labor."

"It used to, but it doesn't any more. My job is handling men and running a department. If I think up an idea that's really the job of Personnel, or Engineering, or Methods, or any other of those fancy departments, whether it applies here in the toolroom or not, I ought to get paid for it. That's not part of my work—to have ideas."

"Sure it is, Ed. You're an idea man, and no mistake. You're supposed to develop new methods and processes."

"Nuts! If I have to have a ruling on whether or not I'm eligible, I won't make any suggestions—or I'll put mine in through one of the boys and split any award with him. What do they want, ideas or no ideas? I've got a better chance to think up ideas on safety, cutting out waste, better working conditions, redesign, rearranging equipment, and some of those things than anybody else in my department; and they're all listed on this blank, Al. If they want those ideas, they ought to pay extra for 'em!"

"Look, Ed, you're part of management, and there's always danger that if management gets awards, the boys will start thinking the whole system is rigged. Then *they* won't suggest anything—and the whole system falls apart."

"Yea, and if I don't keep pushing it, the whole system will fall apart, too! If I'm to encourage the boys to submit ideas, then the management ought to encourage me!"

"They do, Ed. Every time you go up front with an idea, you make your job more solid. And you get recognition in higher pay, too!"

"So does the shop man with ideas. If he has enough of them, they'll make him a foreman—and, meantime, he gets paid awards for his ideas. No, Al, the power of suggestion is stimulated in me just like it is among the boys—by cold cash."

"If that was true, Ed, you'd never have had all the ideas you've had through the years. You're an idea man, and that's why you're foreman."

***SHOULD THERE BE** restrictions on eligibility for suggestion awards? Is the policy of barring awards to supervisors for their ideas in their own department sound? What about methods ideas from methods men, safety ideas from safety men? Other readers will be interested in your opinions on this subject—and we have no restrictive policy on awards. Discussions of earlier topics appear on later pages.*

Practical Ideas

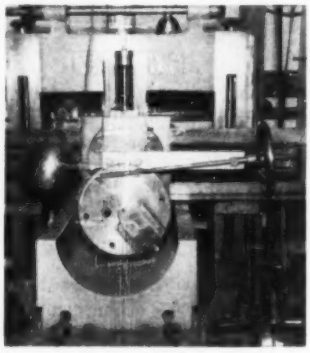
Rotary-Feeding Planer Attachment Bores Out Heater Chests

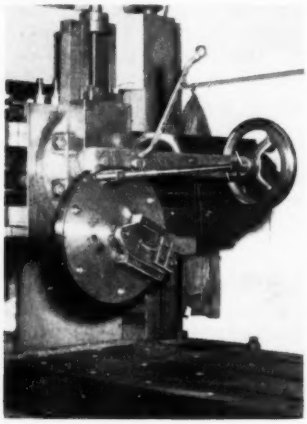
WITHOUT A BORING MILL, we were faced with the job of doing a 13½-in.-dia boring job on cast-iron chests which would receive compound distributors. The photos show the rig we developed to work on a planer.

First, we made a boiler-plate disk with a 12-in. dia, bored on center for assembly to the main planer clapper box by means of a shoulder screw. The assembly was made so the disk was held so it could not tilt, but could rotate. A secondary clapper box to hold ½-in. toolbits was attached to the disk. The disk was indexed slightly after each table stroke until the full cut was made.

Rotary motion was provided by a hand-operated wheel and feedscrew mounted on a 2-in.-wide straight bracket attached to the compound. Near the outer end of the bracket a bearing block was mounted. This cleared the feedscrew, but held it against its own pull because the feedscrew was shouldered toward the outer end.

On the disk was mounted another block, but this was actually a feed nut, tapped to take the





feedscrew. It assembled into any of five holes bored in the front face of the disk. As the handwheel was turned, the feedscrew pulled on the feed nut, rotating the disk. Of course the feed nut was mounted so it could rotate within the hole in the disk.

Actually, only three of the holes in the disk had to be used. By the time the feedscrew end overlapped the hole next to the one in which the feed nut was assembled, we disassembled the nut and moved it to the new hole, then reassembled the feedscrew into the nut.

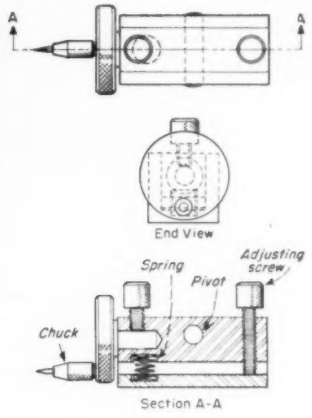
Two chests were bored at each setup in about two hours, with both roughing and finishing cuts being taken. *Robert N. Parks, Mentor, Ohio.*

Adjustable Layout Gage

ITS SIMPLICITY of design and construction and its many practical applications make this layout gage worth building.

Built of cold-rolled steel, the gage consists of a U-shaped outside body, a rectangular inside block, and a knurled wheel pivoted on a stub shaft in the end of the block. The wheel is clamped by a lockscrew operated from the top of the gage. Just under the screw, but not connected with it, is a compression spring working between the body and block. This loads the adjusting screw at the other end of the block.

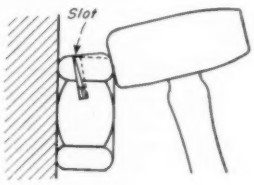
Rotating the wheel makes rough adjustment of the height of the indicator point in the chuck, and revolving the adjusting screw makes fine adjustments. *Martin R. T. Teefey, Detroit, Mich.*

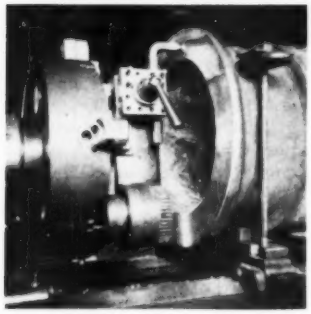


Space-Saving Locknut

WHERE A NUT should be assembled to the end of a stud or bolt with a lock washer, and there is no room for the washer, this method has the same effect in less space.

A slanting cut is taken with a thin saw into one face of a regular nut, extending well into the central hole and thread. The nut is assembled, then is struck with a hammer to distort it. The clamping action of the twisted nut holds it in place. *Robert Laimboeck, Innsbruck, Austria.*



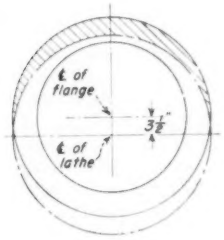


Oscillating Cutter Faces Tank Flange

BOTH ENDS of a lead-lined, 21-in.-dia tank had to be faced off not long ago, but the largest available lathe had a swing of only 23 in. This seemed large enough, but we had to locate the work on the stripped cross-slide, which jacked the centerline up 3½ in. above the center of the lathe spindle. Our first cut, taken with a small cross-slide clamped to the chuck, left a curved sector of the flange at the top of the tank.

The chuck had been fitted with the small slide, toolblock, and bit, and with a counterweight that allolowed rotating the chuck under power at 11 rpm. The tool was advanced by hand.

Although the toolblock would not clear the lathe ways if extended further, it could be advanced up in the air. Therefore, we advanced the tool by hand, and rocked the chuck by flipping a reversing switch back and forth, until the remainder of the flange was faced off. The switch reversed the direction of rotation of the chuck before the tool was brought around close to the lathe bed. *C. Y. Lee, Taiwan, Formosa.*



Layout Dye for Hubbing

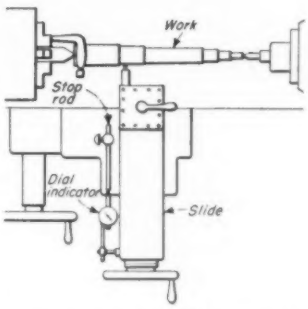
WHEN OIL is utilized as a lubricant in hubbing a die, it often gets trapped in the bottom of the mold and shows up in the cavity. A better lubricant is copper sulphate solution (layout bluing), which forms a thin coating of copper on the work, but does not get trapped. *Chris Sorenson, Los Alamos, N. M.*

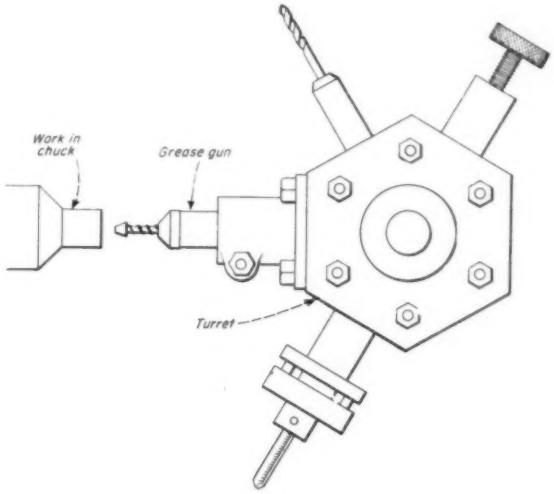
Indirect Indicator Gages Turret-Lathe Settings

HIGH-PRODUCTION turret-lathe work can be simplified if resetting the cross-slide is done, not against the work itself, but with a dial indicator working against a fixed stop on the carriage.

The stop we utilized when turning a number of small shafts was a rod mounted by means of a clamp. This was aligned in the same direction as the slide motion.

A dial indicator was mounted on the side of the slide, near the front, in line with the stop rod. After the initial setup was made and checked, dial settings for the different diameters were noted. The technique would be good for jobs like this one, where the diameters were not too different from each other, but were all within the scale capacity of the indicator. *J. Carlos Salinas, Corpus Christi, Tex.*

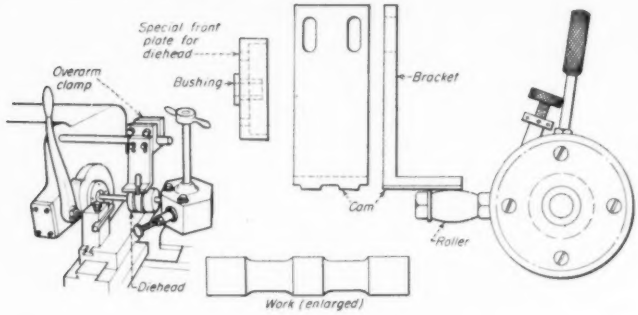




Turret Grease Gun

LUBRICATING COPPER STOCK that has been drilled but not yet tapped is easy when the setup is on a turret lathe. Simply rig a grease gun in the turret hole next to the one that holds the tap, and index the gun into position in the regular turret cycle.

The idea insures better tapping, but adds little extra time to the operating cycle of the machine. *Allan Clarke, Rochdale, England.*



Cam-Directed Diehead Turns and Necks Bar Stock

FOR A RECENT BATCH-production job on brass stock, we made use of a threading diehead equipped with a single-point tool; controlled by a cam that adjusted the depth-of-tool setting by shifting the retracting mechanism of the diehead.

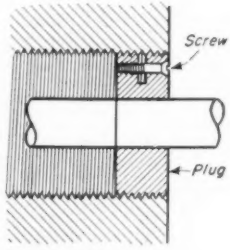
First, the chasers were removed from the diehead, and one of them was ground to a single-point form. This was reinstalled in the head. The front plate of the head was replaced by one that carried a hardened bushing that was a slip fit for the rough round stock. In addition, a short shaft equipped with a roller follower was added to the ring that connected to the retracting mechanism and resetting handle of the diehead.

The head was located in the turret of the lathe. As it was fed forward, the bushing guided it on the stock so the single tool would not exert unbalanced torque to misform the work.

The plate cam was fixed on a bracket clamped to the overarm on the headstock. This was made fairly thin so the roller would follow the lower surface going in, and would clear the other surface coming back out after the die mechanism retracted the tool and shifted the roller.

Although a spring arrangement would be practical on a longer run, pressure of the operator's hand on the resetting handle of the diehead was enough to force the roller against the face of the cam on this short run. As the roller rode the cam face, the tool was automatically advanced or retracted through the diehead mechanism to reproduce the required shape on the work.

During turning, it was necessary to keep the catch pin withdrawn to allow the diehead to retract the toolslide immediately after the roller passed the cam. To overcome the displacement of the roller as the diehead body partly rotated during a cut—thus shifting the tool—the roller was turned to a convex radius. *Allan Clarke, Rochdale, England.*

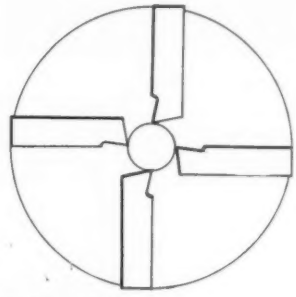


Screw Clamps Plate

THREADED STOP PLATES and various plugs can be clamped in their tapped holes by means of a few alterations directly to the plates.

A cut is taken through one edge of the plate, and a hole is drilled and tapped at right angles to the cut, through the plate. The tapping is actually done only on one side of the cut; the other side is drilled to clear the flat-head screw that assembles into the hole.

When the plate is threaded into the hole it fits and is in position, the flat-head screw is tightened to clamp the threads on each side of the cut together, thus holding the plate firmly. *Robert Laimboeck, Innsbruck, Austria.*



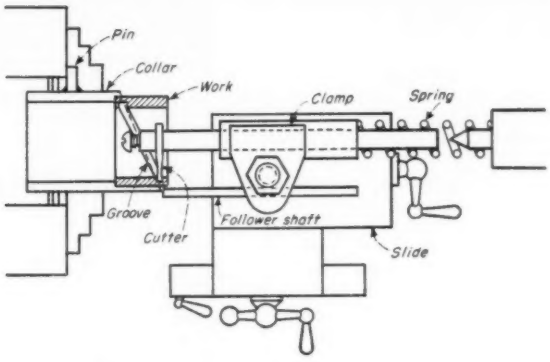
Hollow Milling With a Diehead

BY REPLACING the regular thread chasers in a self-opening diehead with a set of scrapped chasers that had been ground to single points, we made a good hollow-milling tool that turned shuttles for sewing-machine heads. The work was 6¾ in. long and ¼ in. in dia.

First operation was to turn ⅛ in. of length at the outer end of the work to the finished size by means of a toolbit on the cross-slide. Then the slide was backed off, and the diehead was advanced onto the work. Each toolbit took a quarter of the load, as in regular thread chasing, with the last tool making the finishing cut.

As the stop in the turret took effect (the diehead worked from the turret), the diehead opened to clear the bits from the work. *C. Y. Lee, Taiwan, Formosa.*

BROKEN CHUCK WRENCHES are a constant source of trouble, expense, and annoyance. We started making them by inserting ¼-in. tool steel in old T-handles, and have saved all this trouble. The wrenches cost 85¢ as against 45¢ for the regular ones, but last much longer. *Arthur Mack, Ithaca, N. Y.*



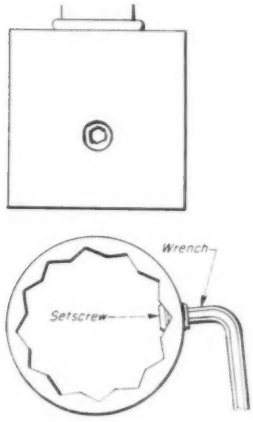
Spring Attachment for Lathe Cuts Bearing Grooves

ACCURACY AND SMOOTH ACTION are the advantages of this attachment, made to cut oil grooves in bearings. Once the main tooling has been built, the setup is readily adaptable for other similar jobs of about the same size.

Bearings are mounted in a recessed adapter collar chucked in the lathe headstock. To make this collar rotate with the chuck, a pin is located in it next to a chuck jaw. Clamping is done lightly so as not to deform the collar. Work is held in the collar by setscrews, with the fit quite close.

On the carriage, which is disengaged from the traversing feedscrew, a cutter spindle and follower shaft are clamped. The cutter spindle supports a single-point boring tool that does the work, while the follower shaft bears against the front edge of the adapting collar. A heavy compression spring between the back end of the cutter shaft and the tailstock provides pressure.

As the follower shaft moves back and forth, following the cam shape cut on the edge of the adapter collar, the carriage is moved, and the tool shifts to cut the oil groove. The cam shape can be a straight line, as shown, or can be any smooth curve. *Robert Laimboeck, Innsbruck, Austria.*



Setscrew Improves Socket Wrench

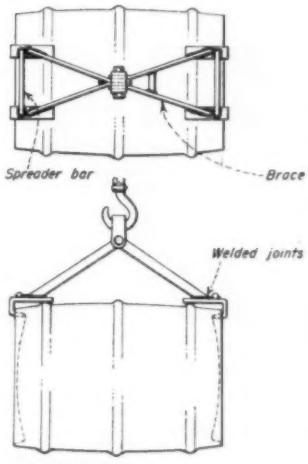
FOR BOLT HEADS that are undersize or somewhat damaged from previous tightening and tampering, a 12-notch socket wrench can be equipped with a setscrew that will take up play.

A hole is drilled and tapped through the socket wall, and a small, headless setscrew is assembled. A hex wrench is utilized to adjust the screw for tightness, or to back it off when the bolt heads are in good condition. One or more setscrews can be inserted, depending on how much play is encountered. *Thomas Trail, Catonsville, Md.*

How to Shorten Screws

SOME TIME AGO we had to have a batch of No. 2 flat-head screws, to a certain non-standard length, in a hurry. We couldn't very well cut off regular screws in a collet setup because they would slip.

Therefore, we drilled and tapped a dozen holes through a piece of flat stock that was just as thick as the length of screw shank we required. Then we assembled the screws into the holes, filed the projecting ends off, and backed them out. *Jack Harris, Long Island City, N. Y.*

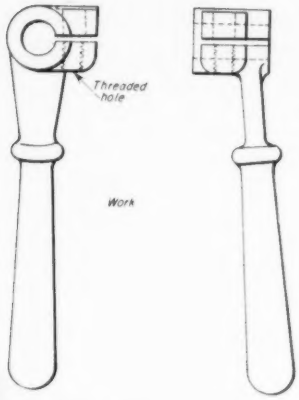


Barrel Hook Is Self Tightening

GOOD ROD and bar stock, not scrap, should be utilized in building the illustrated crane hook for standard barrels. It handles them horizontally, but is fitted with claws that allow tipping the barrel for stacking.

Two arms are welded directly together, and are spread by a bar at the claw ends. The other arms, which do not touch each other at the pivot assembly, are fitted with a welded brace and a spreader bar.

The claws are bent while hot to shape, planned so the actual hook will fit under the lip of the barrel while the heel of the claw will touch the barrel rib. *H. G. Frommer, Milwaukee, Wis.*



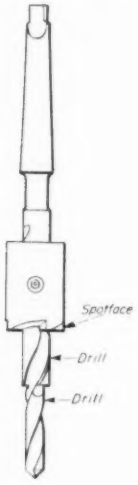
Composite Drill Makes Three Cuts

FOR A DRILLING and spotfacing operation on the hub of a machine lever we were making in quantity, we made this special-purpose drill that does three out of four operations at one setting.

The job is the setscrew hole in a bracket with a drilled head. This hole is tapped up to the split in the head, then a plain clearance hole beyond the split. The face of the head at the lip of the clearance hole was to be cut flat and square.

A drill with right OD for the clearance hole was picked, and was ground down for a suitable length at the tip. The regular diameter of the tap drill for the job was ground. Then a collar was gashed to provide square cutting edges to counterbore the head, and was hardened and ground. This was assembled to the drill with setscrews that locked on the web; placed so the lip of the large drill OD would just go to the split when the counterboring cutter was at full depth.

Cutting was done in a single stroke, and the only operation left to do was tapping the setscrew hole. *John Stewart, Glasgow, Scotland.*



Digit Checking Proves Multiplications

Here is a simple way of proving any multiplication, no matter how large the numbers are. It's handy for shop practice as well as engineering work.

First, add all the figures in the multiplicand, then add them again to reduce the expression to a single digit. Do the same with the multiplier, and multiply the multiplicand digit by the multiplier digit. This results in a number that may be two or more digits. Add these digits to reduce the number to a single digit.

Finally reduce the product of the original multiplication to a single digit in the same way as above. The last two single digits obtained must be identical if the multiplication is correct.

In the example above, we knew there was an error. After working out the multiplication a second time, the original error was easily seen. *Jack Harris, Long Island City, N. Y.*

7254	18	9	
x .318	12	3	
6032		27	9
7254			
21762			
2254772	29	11	2

Incorrect; do over:

7254	18	9	
x .318	12	3	
58032		27	9
7254			
21762			
2306772	27		9
		OK	

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for the best PRACTICAL IDEA

An extra payment of $25 will be made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES — A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author—every item will be edited in accordance with *American Machinist* standards, and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER—Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42d St., New York 18, N.Y.

139th Winner:

(For October 15 issue)

Ben Goodwin

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SHOWS *HOW MUCH* PARTS ARE OUT—especially advantageous where parts are coming consistently on the borderline or just outside tolerance limits.

BETTER FOR BRINGING TO SIZE—Readings can be taken earlier when approaching size so that the operator is sure of not going beyond tolerance, in fact, he can accurately work to desired limits *within* the tolerance zone.

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MORE ACCURATE QUALITY CONTROL CHARTS—the column Precisionaire scale is a running quality control chart in itself. Readings can be transferred to a chart with greatest accuracy.

OPERATORS LIKE THE LONG SCALE—with higher amplifications the spread for the tolerance and each classification is wider, making the operator's job easier.

MODEL NUMBER	MAXIMUM RECOMMENDED TOLERANCE	MINIMUM USABLE SCALE LENGTH BEYOND TOLERANCE LIMITS
1,000	.005	.0025
2,000	.0025	.0013
5,000	.001	.0005
10,000	.0005	.00025
20,000	.00025	.000125

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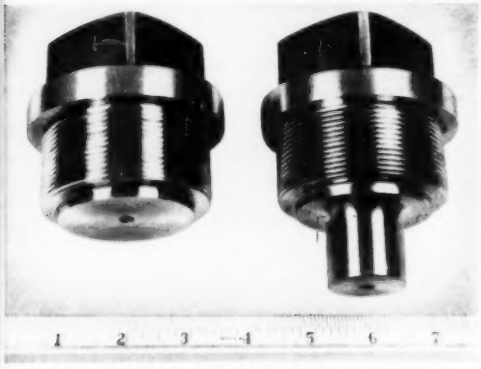
Here are two Armco Stainless Steels that combine excellent corrosion resistance, high strengths and hardnesses with low-temperature heat treatments.

They are known as Armco 17-7 PH and Armco 17-4 PH.

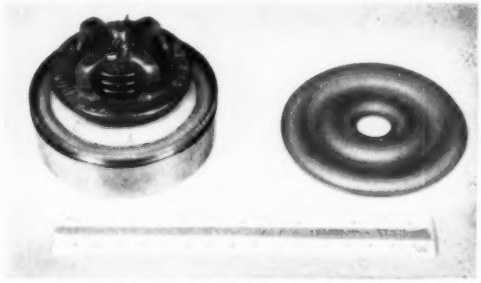
These precipitation-hardening chromium-nickel types offer many new opportunities for the use of stainless steel, and are improved materials for many applications where standard stainless types are now used.

Depending upon condition supplied and subsequent heat treatment, Armco 17-7 PH sheets attain yield strengths of 150,000 to 250,000 psi and hardnesses up to Rockwell C50.

This anti-shimmy damper is one of the 13 production parts of Armco 17-4 PH bar stock used on XJ-1 and B-45 airplanes.



Armco 17-4 PH Stainless Steel bars are used for these valve plugs designed for pump heads in a chemical plant. Plugs are exposed to a solution of basic chromium sulfate at pressures ranging up to 7500 psi. Perfect threads are a "must."



For the best combination of high hardness and corrosion resistance, Armco 17-7 PH strip was chosen for the valve disc of this all-metal pump valve assembly.

Safety valve stem for liquefied petroleum gas tank made of Armco 17-4 PH. This part is upset and forged from bar stock, annealed and machined. Low-temperature heat treatment develops high yield strength without distortion.

ARMCO STEEL CORPORATION

4171 Curtis Street, Middletown, Ohio • Plants and Sales Offices from Coast to Coast • Export: The Armco International Corporation

ARMCO

MORE SCRAP MEANS MORE STEEL . . . TURN YOURS IN TODAY

Corrections for Grinding Errors..!

American Machinist

This check list of causes and corrections for common grinding errors appears in "The Grinding Wheel," a new book published by the Grinding Wheel Institute, and reproduced with permission. The information represents an up-to-date review of the subject by a committee of grinding experts

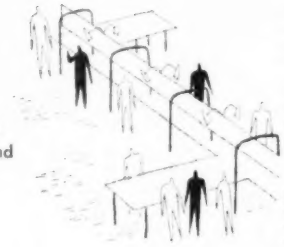
Indication	*Cause*	*Correction*
Short, close, evenly spaced marks.	Loose wheel spindle bearings.	Reduce speed, tighten or readjust bearings, lap bearings to spindle, allow sufficient preliminary heating, take up thrust bearings.
Slightly longer and more widely spaced marks.	Wheel spindle sprung or out of round.	If warped replace, if out of round regrind and lap to new bearing.
Regularly spaced marks.	General vibration.	Check alignment and couplings, be sure motor and spindle are in balance.
Regularly but widely spaced marks.	Uneven flat belt.	Plane belt to uniform thickness and width; have all sections of uniform pliability.
	Idlers loose or out of balance.	Rebush and lap to shaft; balance carefully.
Long, regularly spaced chatter marks forming checkerboard pattern.	Wheel out of balance.	Rebalance carefully on own sleeve, repeat after truing. If trouble persists run wheel without coolant to throw off excess water, store on side to prevent water from settling at lower edge of wheel.
	Wheel out of round.	True before and after balancing; true sides to face.
Chatter marks long and widely spaced, regular in pattern but may vary around body of work.	Back-lash in drive gears.	Replace old gears or use V-belt drive; check lubricant
Regular or irregular marks.	Faulty thrust bearings.	Replace thrust bearings.
Regular or irregularly spaced marks of any width but following one pattern.	Metal belt lacing on spindle drive.	Use endless belt.
Regularly spaced but occurring more frequently than above.	Loose pulley on spindle.	Tighten pulley.
Chatter marks synchronous with building vibration.	Building vibration.	If a heavy grinder provide a separate foundation independent of floor. If a light grinder tighten or loosen anchor bolts. Vibration dampers will often help. Moving the machine to a better location is sometimes the right solution.
Chatter marks fairly long, wide and evenly spaced at wide intervals and generally discolored; wheel glazed or loaded.	Wheel too hard.	Select softer grade or coarser grit. See "Wheel Glazing."
Irregular chatter marks.	Work centers or work rests not true or improperly lubricated.	Check fit of centers and rests, provide constant and even lubrication. On large jobs such as in roll grinding provide hold-down clamps on necks and arrange for adequate lubrication.
General.	Dressing.	Use sharp diamond rigidly held close to wheel.
Narrow and deep regular marks.	Wheel too coarse.	Use finer grit.
Wide irregular marks of varying depth.	Wheel too soft	Use harder grade. (See Grinding Grade of Wheel.)
Widely spaced spots on work.	Oil spots or glazed areas on wheel face.	Balance and true wheel. Avoid getting oil on wheel face.
Uneven marks on work.	Whipping belt.	Take up belt.
Fine spiral or thread on work.	Faulty wheel dresser.	Replace cracked or broken diamonds; use slower dressing traverse; set tools at angles of 5 degrees down and 30 degrees side; turn diamond every third dressing; tighten holder of diamond. Dress with less penetration; do not allow tool to dwell in contact with wheel; do not start dressing cuts on face — locate diamond on face but start cuts from edge. Make final pass in dressing in direction opposite to grinding traverse; traverse diamond evenly across face of wheel; round off wheel edges.
	Faulty operation.	Prevent penetration of advancing or following edge of wheel by being careful to dress wheel face parallel to work; reduce wheel pressure; replace worn parts which permit swiveling of wheel head. Provide additional steadyrests; reduce traverse in relation to work rotation; when making numerous passes make slight change in traverse rate at each pass to break up pattern.
Wavy traverse lines.	Ragged wheel edges.	Round off wheel edges.
Uneven traverse lines.	Worn traverse drive parts.	Eliminate play; replace worn parts.
Isolated deep marks.	Improper wheel dressing.	Use sharper dressing tools; flush wheel with coolant after dressing.
	Chatter or hammering.	Remove cause. (See Chatter marks.)
	Coarse grits or foreign matter in wheel face.	Remove by dressing.

the truth about Dow Corning Silicones...

. . . is more fantastic than the patter of the pitchman or the spiel of the barkers that doubled in advertising and sales a generation ago. For example:

- Silicone (Class H) electrical insulation makes motors and other kinds of electrical equipment last 10 times as long as they ever did before.
- These same insulating materials are used to double the power per pound ratio in electric machines.
- Silastic,* the Dow Corning silicone rubber is used to seal hot air at 600°F., hot oil at 350-400°F., limit switches and bomb bay doors at −100°F.
- Dow Corning Silicone oils and greases make permanent lubrication a practical reality.

To many engineers and executives, such silicone facts as these still sound too good to be true. That's why we have built and assembled 16,000 pounds of demonstration units and typical applications to prove that our silicone products will do all that we claim for them. This is the first comprehensive Silicone Exposition ever assembled. Previewed in Washington, D. C. during the week of October 22nd, this exhibit will be given private showings in major industrial centers across the country.



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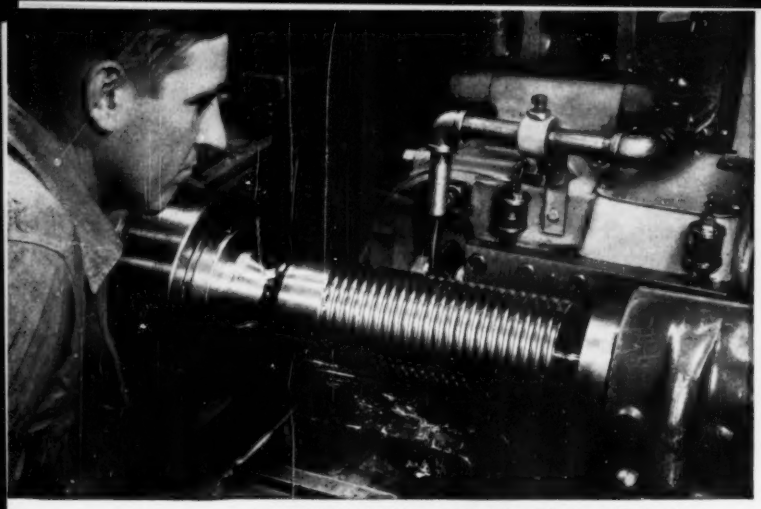
Corrections for Grinding Errors...II

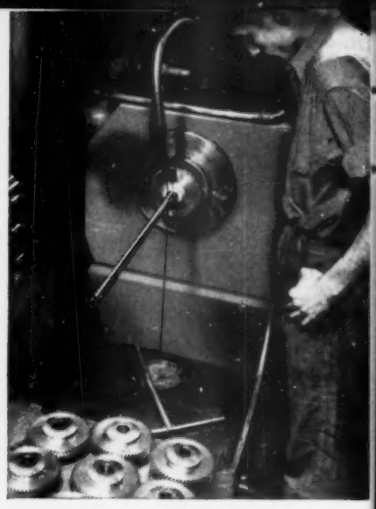
CYLINDRICAL GRINDING . . . continued

Indication	*Cause*	*Correction*
	Bond disintegrates, grit pulls out.	Coolant too alkaline for some organic bonds; decrease soda or change coolant.
Irregular marks	Loose dirt settling on machine.	Keep air and shop clean; install dust collectors.
Irregular marks of various lengths and widths; scratches usually fishtail.	Dirty coolant.	Provide efficient filter; clean tank often, flush guards, etc., after dressing and when changing to finer wheels.
Deep irregular marks.	Loose wheel flanges.	Tighten flanges using blotters or lead washers.
Grit marks.	Wheel coarse or too soft.	Select correct wheel
	Too much difference in grit size between roughing and finishing wheels.	Use finer roughing wheel or finish out better with roughing wheel.
	Dressing too coarse.	Less dresser penetration and slower dresser traverse.
	Improper cut from finishing wheel.	Start with fairly high work and traverse speeds to remove previous wheel marks; finish out with high work and slow traverse speeds, allowing wheel to spark out.
SPIRALS ON WORK		
Spirals (traverse lines) same lead on work as rate of traverse.	Misalignment	Check alignment of head and tail stocks; also wheel head to work.
	Truing	Have truing tool set exactly on work-wheel contact line but pointed down 3 degrees. Round off edges of wheel face.
GRINDING GRADE OF WHEEL		
Lack of cut; glazing; some loading; burning of work; chatter.	Wheel acts too hard.	Increase work and traverse speeds; decrease spindle speed, wheel diameter and width of face; open up wheel by sharper dressing; increase wheel pressure (infeed); avoid dwell at end of traverse; avoid gummy coolants; use coarser grit or softer grade wheel.
Wheel marks on work; short wheel life; not holding cut; tapered work.	Wheel acts too soft.	Decrease work and traverse speeds and wheel pressure (infeed); increase spindle speed, wheel diameter and width of face; dress with slow traverse and slight penetration; filter coolant; do not pass off work at end of traverse.
CHECKING OF WORK		
Work shows check marks.	Improper wheel manipulation.	Prevent wheel from acting too hard. (See Grinding Grade of Wheel.) Do not force wheel into work; use larger and more even flow of coolant; prevent belt slippage.

Indication	*Cause*	*Correction*
WHEEL LOADING		
Metal lodged on abrasive grains or in wheel pores.	Incorrect wheel.	Use coarser grit or more open structure to provide chip clearance; use type of abrasive that fractures more easily; use more coolant.
	Faulty dressing.	Use sharper dresser; dress faster; clean wheel after dressing.
	Faulty coolant.	Use more, cleaner or thinner coolant.
	Faulty operation.	Manipulate to soften grinding grade of wheel. (See Grinding Grade of Wheel.) Use less infeed.
WHEEL GLAZING		
Shiny appearance; slick feel.	Improper wheel.	Use coarser grit, softer grade; manipulate wheel to get softer grinding effect. (See Grinding Grade of Wheel.)
	Improper Dressing.	Keep wheel sharp with sharp dresser, faster traverse, deeper penetration.
	Faulty coolant.	Use less oily coolant; use more coolant.
	Faulty operation.	Use greater infeed. (See Grinding Grade of Wheel.)
	Gummy coolant.	Increase soda content if water is hard; do not use soluble oils in hard water.
INACCURACIES IN WORK		
Work out of round.	Uneven pressure of driving dog.	Provide cushion between dog and work.
Work out of parallel or tapered.	Faulty grinding machine.	Correct worn ways and setting of tail- or headstock; tighten spindle bearings.
	Improper dressing.	Make sure machine conditions are same at point of dressing as at point of grinding.
	Improper operation.	Do not permit wheel to pass off work at end of traverse, which causes taper at work ends; reduce wheel feed; use harder wheel.
	Expansion of work.	Reduce temperature of work by using more coolant and lighter cuts.
BURNING OF WORK		
Work shows discoloration.	Improper wheel.	Use softer wheel or manipulate to get softer effect. (See Grinding Grade of Wheel.) Prevent glazing and loading; use more coolant; prevent chatter.
	Faulty operation.	Bring wheel to work more gradually, use less infeed; eliminate belt or wheel slippage; prevent possible stoppage of work.



THREAD MILLING A SCREW. Metal: SAE 2345 steel heat-treated to 28 Rockwell • Machine: Lees Bradner thread miller • Part: 5¼" adjusting screw for press brake • Operations: rough and finish thread milling Tool: high-speed steel • Feed: 0.260 depth on roughing Cutting Oil: Sunicut 105



BROACHING A GEAR KEY-WAY. Metal: SAE 2345 steel forging 220 Brinnell • Machine: 3L8 La Pointe hydraulic broach • Part: gears for shaper, produced two at a time • Tool: 3' high-speed steel broach • Cutting Oil: Sunicut 105

SUNICUT 105 REPLACES THREE OILS AND SOLVES FIVE MAJOR PROBLEMS

Buying three cutting oils and then blending them to make additional grades had proved highly unsatisfactory to a machine tool builder. The smoke was noxious, employees complained of skin irritations, the color of the oils made it difficult to see the work, tool life was short and finishes not up to standard. To help solve these problems, the company called in a Sun representative and on his advice tested Sunicut 105 on the three tough jobs pictured here.

So good were the results that the company adopted Sunicut 105 for every machine in the plant and has used it exclusively for the past two years. The operators like its transparency. There are no complaints about smoke or skin irritations. Finishes have improved and tool life increased as much as 50 percent.

For complete information on Sun's cutting oils, write to Department AM-7 and we will send you a copy of our informative, illustrated booklet "Cutting and Grinding Facts."

CUTTING A LARGE GEAR. Metal: bronze 180 Brinnell • Machine: Gould & Eberhardt gear hobbing machine • Part: main drive worm gear wheel for large shear • 42⅛" O. D.; 5" thick; 87 teeth • Tool: high-speed steel hob • Feed: 0.006 • Speed: 42 rpm • Cutting Oil: Sunicut 105

SUN INDUSTRIAL PRODUCTS

SUN OIL COMPANY, PHILADELPHIA 3, PA. • SUN OIL COMPANY, LTD., TORONTO AND MONTREAL

SUNOCO®

Corrections for Grinding Errors...III

CENTERLESS GRINDING

Indication	*Cause*	*Correction*
Irregular light and dark spirals.	Stock.	Remove all oil from stock straightener, use detergent coolant.
	Dressing.	Dress regulating wheel at same angle as wheel setting, otherwise small diameter work may be bent while traversing due to uneven pressure. If clearance angle is wanted apply to grinding wheel.
Scratching (Fine Wheels).	Work support blade.	For ultra finish grinding, resinoid, brass, leather or hard rubber work support blades are best.
Scratching (General).	Work support blade.	For soft steel use cast iron work support blades.
Periodic deflections of work.	Work support blade.	Reduce top angle. For large diameter work the blade angle should be less than when using the same length of blade for smaller diameters.
Chatter.	Wheel.	Too hard or too fine; loose on sleeve. Correct these conditions.
Chatter.	Work support blade.	Too sharp an angle or not properly clamped.
Scoring.	Coolant.	Requires more lubricating qualities.
Spirals on work.	Wheel cutting too heavily on front or back, or not cutting in center of wheel.	Dress grinding wheel so that it cuts from front to within $\frac{1}{2}$" to 1" back of edge.
	Work support plates not parallel with work contact line on regulating wheel.	Line up guide plates with lining bar of approximately same diameter as work being ground. If guides are parallel and wheel dressed correctly increase regulating wheel housing angle $\frac{1}{2}$ degree more than regulating wheel truing device angle.
High centers, low ends.	Improper alignment of guides or regulating wheel angles.	Align guides and if still at fault decrease regulating wheel angle by $\frac{1}{4}$ degree steps until corrected.
Low centers and high ends.	Improper alignment of guides or regulating wheel angles.	Align guides and if still at fault increase regulating wheel angle by $\frac{1}{4}$ degree steps until corrected.
Work out of round.	Too heavy stock removal on roughing cuts.	First cut light to round up work, then use heavier cuts.
	Too few passes on hardened work.	Increase number of passes if necessary.
	Too near center line of wheels.	Raise center height of work to one half diameter of work above center line of wheels.
	Not enough coolant.	See that copious supply of clean coolant is available at point of contact.
Chatter.	Wheel grade too hard.	As last resort use softer wheel.
	Loose spindle bearings or other loose drive parts.	Lap spindle bearings.
	Too high above center.	Decrease center height.
	Too great angle on work rest blade.	Use 30 degree blade angle which is sufficient in 90% of cases.
Unable to straighten kinks out of shaftings.	Shafting not straightened in punch press or other device.	Straighten as well as possible; a centerless grinder is not a straightening machine.
	Failure to allow enough stock on the work for grinding.	Allow grinding to equal from $2\frac{1}{2}$ to 3 times the amount of run-out.
	Too great grinding pressure.	On first pass take light cut at low wheel speed and high traverse rates.

INTERNAL GRINDING

Source of fault	*Methods of correction*
Spindles.	High speed internal grinder spindles of the ball bearing type are very sensitive to slight irregularities. Because of their special construction and special races and balls it is best that repairs be made only by the spindle manufacturer.
Machine play.	Since both wheel and workheads may be of the swivelling type they must be checked for play and anchorage.
Belts.	Internal grinder belts with their high speed, short centers and small diameter pulleys must be checked frequently for oiliness, wear and tightness; slippage is an especially serious fault.
Dressing.	Faulty dressing is one of the most frequent causes of faulty grinding, short wheel life and poor finish. Keep careful watch to prevent wear in the diamond holder bearings. Because of the small size of the wheels used in internal grinding it is essential that the diamond be of proper size and maintained with a sharp point.
Wheel characteristics.	Most internal wheels are less efficient than other wheels because of the extreme change in wheel diameter with no corresponding change in spindle speed. It is often possible to increase wheel life by using a wheel of greater width. Due to the limitations of chip clearance in internal grinding it is necessary to use coarse, open wheels.
Taper in straight hole.	Be sure wheelhead is parallel with table travel; use softer wheel or increase work speed for softer effect; correct work or wheelhead angling; prevent gumminess of coolant; use lighter infeed; be sure wheel is dressed parallel to table travel; use harder wheel.
Bell-mouth.	Reduce overtravel of wheel from hole.
Faulty taper	Be sure wheel is parallel to desired taper; eliminate backlash in headstock; harden or soften grinding grade of wheel as required. (See Grinding Grade of Wheel.)

Production News

ABOUT *Lusol*—THE ALL-CHEMICAL METAL-WORKING SOLUTION

FROM F. E. ANDERSON OIL COMPANY · PORTLAND, CONNECTICUT

Lusol Outcools, Outproduces All Other Coolants

You can get far greater production from your shop, and you can do it without adding a single machine or tool or man, simply by switching to Lusol. You can prove these facts about Lusol to your own satisfaction in your own plant—just as thousands of others have already done.

Lusol is a clear, all-chemical concentrate that is diluted with water and used in the coolant system of almost every type of machine tool—lathes, grinders, milling machines, saws, broaches, even rolls and presses. In each of these operations we have cases of increases in tool life as high as 500% and even higher. Less down time for tool dressing means greater production. Work stays cooler because Lusol is a super-coolant. Oilless Lusol reduces the surface tension of water so it penetrates to the very cutting edges of the tools, keeps grinding wheels from loading up.

Workers like Lusol! A mild combination of chemicals, milder than most toilet soaps, Lusol by itself can't become foul smelling or cause dermatitis. Workers' hands, clothes and the surrounding floors stay clean and non-oily. Frequently, parts made with Lusol need not be degreased before painting, plating or assembly. While not a rust preventive, Lusol reduces the possibility of rust on parts that are stored between stages of production.

★

Lusol increases speed, improves finish on aircraft fastener job!

The parts at left are fasteners for supersonic aircraft (shown about twice actual size). They are made of 2317 nickel steel, turned on a No. OOG Brown & Sharpe automatic screw machine.

Part No. 1 was run with a sulphur base cutting oil. The finish was poor and the cycle slow (49 seconds). Increasing the speed burned up the tools. A switch to Lusol, diluted 30 to 1, at the same feeds and speeds, gave no better finish (see Part No. 2). Then the cycle was increased from 49 to 33 seconds and the finish improved, as shown on Part No. 3. Increasing the spindle speed from 1600 to 2250 rpm, machine cycle of 33 seconds, gave an exceptionally fine finish, as shown on Part No. 4. Tool life was lengthened considerably.

users say*

case histories of Lusol at work

A CONVEYOR MANUFACTURER—"8,000 forged steel brackets produced per broach grind with Lusol in the machine, compared to the previous 3,500 pieces. Doubled production and less down time for changing broaches for resharpening."

A FARM EQUIPMENT MAKER—"Have had outstanding success on deep drilling in balancing crankshafts. Drill 7/16" holes and, where we could only go 2 1/2" deep, we now go as deep as 3 1/2" with Lusol."

A SUBCONTRACTOR—"No greasiness on the finished parts, so we bundle them for shipment just as they come off the machines. Some have to be given a prime coat of paint; we simply wipe them off with a cloth and then spray them."

A CRANKSHAFT MANUFACTURER—"We wash $5 worth of grinding wheel down the sewer every time we dress a wheel. Since we adopted Lusol for our entire grinding department, we've saved an awful lot of money by reducing the number of dressings our wheels require."

*Users' names furnished on request.

FREE BOOK

Get complete facts about Lusol by writing for this 20-page booklet. It contains information on machine cleaning, maintenance of Lusol solutions, elimination of dermatitis and odor in machines, plus many case histories of Lusol at work. Write F. E. Anderson Oil Company, 215H, Portland, Conn.

TALKING SHOP

Shop Church

GERBER PLUMBING FIXTURES COMPANY, Chicago, in its Plymouth, Ind., Wirebound Crate Division (100-odd men) has been holding church services on company time for the past ten months at employee request. Called the "Gerber Plan for In-Plant Religious Participation," services are held as the workday begins each Wednesday at 7 AM. They last 30 min, and local ministers alternate in conducting them. Officials feel that the time is more than compensated for in practical disappearance of grievance problems, sharp reduction in labor turnover and minimizing of absenteeism, better employee-management relations, and improved production. There is greater interfaith understanding, and 12% more employees now belong to churches. Even profanity has declined, and employees of three other local plants come over. Officials point out that one service a week has proved better than a shorter one each day, that employees themselves asked for it, that services are inter-denominational (in fairly close proportion to the denominations represented on the payroll), that no one is required to attend, and that a committee handles the plan—not the company.

Military Develops

AMONG LATEST MILITARY ITEMS are double-size cutaway models of the .30-cal Browning MG, .30-cal rifle and carbine for National Guard units. Some 2000 of each have been made, after development by the NGB and the Special Devices Center, ONR. . . . Another item is a 67-lb gyrocompass developed by Arma Corp to replace a 550-lb World War II model, and more capable of withstanding rough treatment. . . . Plastics are finding extensive use, including a 36-ft landing craft of fiber glass and polyester resin, plastic lenses for binoculars, and plastic sanitary equipment.

Call in the Boss

AN EMPLOYEE COMMITTEE at the Van der Horst Corp of America, Olean, N. Y., can call any of the top brass in to "testify" as to plant conditions, profits, wages, etc. It's part of a profit-sharing plan which splits up 25% of the profits before taxes (each 3 months) among the non-salaried help. A recent wage dispute was settled in half an hour by the committee conferring with Pres Hendrick Van der Horst.

Selenium Rectifiers

NEWEST DEVELOPMENT in the dc arc-welding field is application of the selenium rectifier. Efficiency is claimed extremely high, and maintenance costs are insignificant, compared to those of M-G sets. Manufacturers are flooded with orders.

Daffynitions

THERMOCOUPLE: newlyweds . . . EXECUTIVE: man with worried look—on the face of his assistant . . . CHLORINE: night-club dancer . . . COPPER: guard on fire escape at girls' dormitory . . . ANTIMONY: fee collected by ex-wives . . . OXIDE: outer covering on an ox . . . LATTICE: a vegetable . . . MISCIBLE: unhappy . . . SILVER: the Lone Ranger's horse . . . TIN: not fat . . . CARBON: storage place for street cars . . . BARIUM: what you do to dead people . . . BORON: man with low mentality . . . ATOM: Eve's husband . . . TENSION: Army order . . . FEHLING: flunking . . . CATALYST: ranch owner.

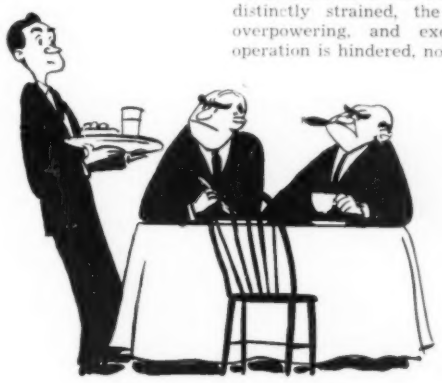
The Dial is Ours

DIAL INDICATORS are so commonplace that few people give any thought to where they originated. Those who do often assume the tool to be of English or German origin. As a matter of fact, the first one was made in Waltham, Mass., by John Logan. He called it a "rack and pinion gage," and it was a watchmaker's jaw gage and depth gage combined. Produced originally in 1874-75, the same type is still made.

Ten years later, Randall & Stickney bought the Logan patents and started making the gages for the paper and rubber industries, where they were used for quite a while before their introduction to machine shops. About 1900, C. H. Lucas started making a similar gage, with a watch fusee chain instead of a rack and pinion. These were also intended for paper-mill work.

Lunch Saga

SMALL COMPANY we've heard about installed an executive dining room "to enhance cooperation." It was at first quite popular—the convenience and exclusiveness, y'know. But protocol entered even there; head and foot tables were soon distinguished, and woe to the small fry who sat at the big-fry table! In the face of that, an increasing number of the junior executives began to eat out, first with excuses, then with impunity. Came an executive order that designated personnel were to eat in the private dining room unless out of town. Now the atmosphere is distinctly strained, the silence is overpowering, and executive cooperation is hindered, not enhanced.



News of Metalworking——

METALWORKING ABROAD

by McGraw-Hill World News

AUTO FIRMS MERGE — Austin Motor Co. Ltd. and Morris Motors Ltd. of England have merged. Reason, said a Nuffield Organization announcement: "Unified control would not only lead to more efficient and economic production but would also further the export drive and be particularly beneficial to manufacturing and assembly abroad."

G-E EXPANDS IN BRAZIL — International General Electric will invest $12 million next year in expansion of its manufacturing facilities at Sao Paulo, Brazil, in order to add output of refrigerators and low-horsepower motors to its list of products made in Brazil.

$525 BUYS A FLEA—A new baby roadster has been successfully tested on the difficult island roads of Palma de Mallorca. Called the "Pulga" — Spanish for flea — the roadster weighs 275½ lb, is 6-ft long, has a 1¼-hp engine in the rear, two back wheels and one front wheel. Top speed is 37 mph, gasoline consumption is 120 mpg. The Pulga plant will build 25 roadsters a month to sell for $525 retail.

$25 MILLION FOR LOCOMOTIVES—A $25-million contract for manufacture and delivery of 120 diesel-electric locomotives has been signed by Central do Brasil Railway. Work will be done by Baldwin Locomotive, General Electric, and The Montreal Co. The contract is to be financed without reference to either Point 4 finance or any international lending organization.

GERMAN-SPANISH TOOL PACT—An agreement for production of 65% of all machine tools needed by Spain's heavy industry has been reached between the Spanish firm "Empresa Auxiliar de la Industrial Pesada" and the German firms of "Gutehoffnungshuette," "Scholemann A.G.," and "Maschinenfabrik Augusburg-Nuernberg A.G." The Spanish firm will build heavy equipment locally with technical aid, patents, blueprints and basic machine tools supplied by the German outfits.

Delay in Delivery of Components Holds Up Aircraft Production

WASHINGTON — The same valves, fasteners, small motors and other industrial components that stalled output of planes, ships and tanks in World War II, are bogging down the present arms build-up. Snarls in production and deliveries of such things as fuel pumps, landing gear parts, even rivets, rank second only to the more publicized shortage of machine tools in delaying output of military aircraft.

Moves of the National Production Authority this week to get more components faster for key military end items underlined the seriousness of the problem. NPA chose a drastic remedy—it's getting set to schedule the production and deliveries of some critical components.

• **What ails production** of components for military programs is a combination of woes stemming from both regulatory and human inadequacies. In some cases components makers didn't get enough metal to meet all demands, or even all the metal alloted to them by NPA. In other cases, the military increased end-item production schedules.

Even more important has been the lack of central control over the flow of finished components into military and directly supporting production. Because of the need for components for all kinds of civilian needs, NPA has been reluctant to give the military some kind of super priority to get what they need. NPA feared military procurement officers would hoard components.

• **What NPA is doing** about these complaints amounts largely to a holding operation until it can get geared for scheduling of the production and distribution of key components.

First, it set up special staffs in its Metals & Minerals Bureau to handle requests for assistance in obtaining allotments of copper, steel and aluminum. These staffs will try by persuasion to get producers of the three metals to take orders from manufacturers who cannot place orders themselves.

Second, expediting-scheduling staffs will be established in the NPA divisions which handle allotments for all types of industrial and agricultural equipment, including components. But, until the staffs have the manpower and know-how requisite for scheduling, they'll concentrate on other methods of stepping up components production.

Here are some of the things NPA and DPA Administrator Manly Fleischmann has told them to do along those lines:

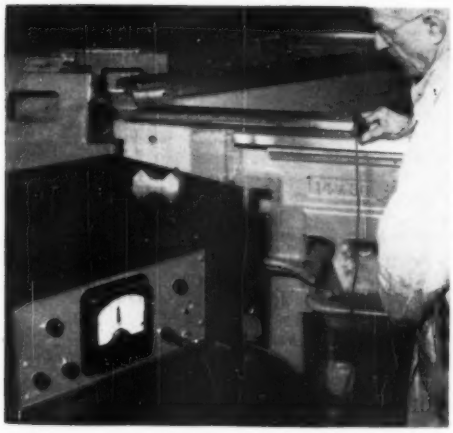
1. Keep tabs on producers of components for military items and equipment needed in certain defense plants—like new steel mills and aluminum plants. Screen appeals for additional materials above the amounts alloted them, and get fast action on the reasonable requests.

2. Schedule production and deliveries of components urgently needed for military and important supporting production, where other orders are interfering. That means, say, placing an order for valves for aircraft ahead of one already placed by an auto manufacturer. This may be done by means of a directive affecting a single plant and displacing a single order. Or it might mean the rescheduling of the entire production of one or more valve producers for three months or more.

3. Give a "super priority" to companies producing components primarily for important defense programs. This will be done by attaching identification symbols to the materials orders of companies devoting, say, 90% of their total output to military production.

4. Screen future allotment requests of components makers to make sure they allow for upcoming shifts in military programs. The NPA men will get continual reports from the armed services on production plans.

Mr. Fleischmann is wangling from the armed forces a revision of their own program urgency ratings. This is a list of finished items—planes, ships, guns—in the order in which the services want delivery of them. Mr. Fleischmann wants this further broken down to get preferences among the many items the military brass now rate as of top urgency.



Hardness of a lathe-bed way is tested with a General Electric metals comparator at Hendey Machine Co., Torrington, Conn. After induction hardening the lathe-bed ways are measured against a master sample calibrated at "70 scleroscope." Comparator indicates whether the bed is harder, softer or the same as the master sample. Hendey officials describe the operation as the only known method of testing bed ways for hardness without leaving a mark on the metal

Basic Steel Wage Increase Will Affect Metalworking Industries

WASHINGTON—As before, metalworking and other industries will feel the effects of the wage increase —and possible other new working conditions—certain to come in basic steel with the new year.

What everybody is most concerned about, even in Washington, is how big the increased wage costs will come to, what they will necessitate in higher prices, and what will be left of wage-price stabilization. Mobilizer Wilson is adamant in his position that, come what may, wage and price controls will not be scrapped.

• **A wage increase** of at least six cents an hour is coming to the Steelworkers under present wage-control rules on the basis of the Oct. 15 cost-of-living index. The Nov. 15 index could push it up another penny. So figure on that as rock bottom.

But the thing to look out for are any new or exceptional twists which, if approved, will revise the rules or in some other way open the door for larger increases. For instance, the Wage Stabilization Board might approve an increase to match the cost-of-living since the price index available when steel gave a 16-cent boost Dec. 1, 1950. That would come to about 14 cents. And other unions would want to use their last contract as a cost-of-living base instead of the normal Jan. 15, 1951.

There are other union demands which, if won, this and other unions will try to get from other employers.

• **The union shop** heads the list. Unions are fighting hard for this not only in steel but in other industries.

Then there is the guaranteed annual wage. The steel workers know they can't get a full annual guarantee. But they would like to nail down some minimum guarantee.

Paid holidays, if won in steel, won't raise much of a problem in metalworking. They are quite common in automobile, electrical and other metal fabricating plants.

Machine-Tool Builder Changes Name

CHICAGO—Charles H. Besly & Co. will change its corporate title to Besly-Welles Corp. on Jan. 1, 1952, recognizing a 65-year association of the Welles family with the firm. Besly-Welles headquarters and Besly-Titan Abrasives sales offices will be established at 20 N. Wacker Drive, Chicago. The Cutting Tool Div. will have its offices and local stocks at 184 N. Wacker Drive. National sales will be handled direct from the company's plant at Beloit, Wis.

Small plant network proposed — A "Small Plant Network Plan" has been proposed by the Commerce & Industry Association of New York, Inc., grouping together into working units five or ten small plants having the necessary combination of equipment required to turn out any specific item of material needed for defense. One of the firms would act as prime contractor. The network units would be formed by selecting, from a master file of small plant machine tools throughout the country, groups of shops having the necessary facilities.

New scholarship plan — A new plan in the Warner & Swasey Co. apprenticeship system of career training provides that, upon satisfactory completion of the regular four-year training and of the collateral night-study program at Fenn College, graduate apprentices shall receive two-year scholarships totaling up to $1500 tuition and $1000 expenses to complete their education at the college of their choice.

Industrial truck group votes — Walter E. Schirmer, vice president of Clark Equipment Co., was elected president of Industrial Truck Association at the annual meeting in New York Dec. 11. Prentice Brown, general manager of Crescent Truck Co., was elected vice president.

Precision gears for X-ray diffraction —Arthur Schussler removes a group of ring gears from a hobbing machine in the Mt. Vernon, N. Y., plant of North American Philips Co., Inc. These gears are important to the accuracy of the wide-range goniometer, used in X-ray diffraction work

INDUSTRIAL BRIEFS

Ohlen-Bishop Mfg. Co., Columbus, Ohio, a subsidiary of Rockwell Mfg. Co., Pittsburgh, has changed its name to Rockwell Tools, Inc. Rockwell purchased Ohlen-Bishop, manufacturer of saws, in May of this year.

The Ordnance Aerophysics Laboratory at Daingerfield, Tex., has been established as a separate division of Consolidated Vultee Aircraft Corp. J. E. Arnold was named division manager.

Economy Pump Div. of Hamilton-Thomas Corp., Hamilton, Ohio, has been consolidated with C. H. Wheeler Mfg. Co., Philadelphia, another division of the corporation. Production, engineering and sales departments of Economy are being moved from Hamilton to the Philadelphia plant. Economy pumps will now be known as Wheeler-Economy Pumps.

Andrews-Burnett Co., Manufacturers representative, at Cincinnati, has been formed by E. B. Andrews and Frank A. Burnett, to handle limited lines of machine tools, cutting tools, and production facilities. Mr. Andrews was with E. A. Kinsey Co. for 25 years, most recently as general sales manager at Cincinnati. Mr. Burnett was district manager for Ampco Metal, Inc., for seven years at Indianapolis and for two years at Cincinnati.

Crane Co., Chicago, manufacturer of valves and fittings, has entered the aviation field by acquiring the assets of Hydro-Aire Co., Burbank, Calif., manufacturer of valves, filters, and actuators for aircraft and engine manufacturers.

Cherry Rivet Div. of Townsend Co. is building a new $1-million plant at Santa Ana, Calif. Operations will be moved there from the present facility at Los Angeles.

Baldwin-Lima-Hamilton Corp. has opened a sub-office at 610 South Main St., Los Angeles, with H. A. Nielsen in charge.

Reed-Prentice Corp., Worcester, Mass., has opened a branch sales office at 2842 West Grand Blvd., Detroit. Iver J. Freeman has been named manager.

British Cut to Bone Their

WASHINGTON — The British will have taken delivery of more than 1000 U. S. machine tools for their defense production program by the end of this year, S. A. Rawson, director-general of machine tools for the United Kingdom, declared in an interview with AMERICAN MACHINIST. Mr. Rawson, in private life joint managing director of John Brown, Ltd., shipbuilders, is in this country to try to speed delivery of machine tools critical to the British program.

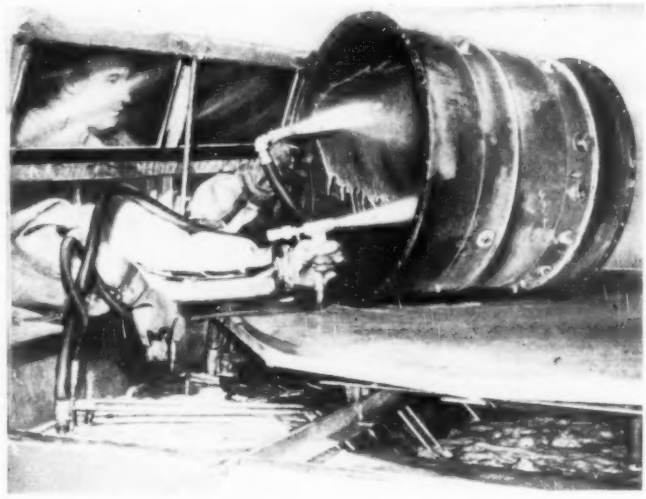
The British have cut to a minimum their machine-tool requirements from the United States, Mr. Rawson pointed out. They originally placed orders here for some 9000 machines, mostly at a time when the American machine-tool industry had a light domestic defense load. But when the U. S. program got going, London slashed its needs from this country about one-third, and eventually will take 6000-6500 machines.

The result of this action, Mr. Rawson said, is that the British were forced to turn to continental Europe for many more machines than they had thought could be secured there. As of today, British orders with western European builders total some 12,000 units.

• **Britain's own machine-tool** industry will produce around 18,000 units for the U. K. defense tooling program. This means that only about 15% of London's machine-tool requirements will come from the United States.

What the British want now, Mr. Rawson indicated, is a preferential rating to enable them to secure certain machine tools—say six machines essential to begin production on a line for which all the other machines are at hand—earlier than they had been scheduled. Requests for these machines are backed up by fully documented facts about each machine—exact size and necessary tooling, where it is to go, the job it is to do, output expected from it, and so on.

These facts, in turn, were obtained from visits of British teams to the factories for which the tooling is needed, Mr. Rawson emphasized. The teams are comprised of technicians,



Cleaning of experimental jet-engine parts at Pratt & Whitney prior to "black" light inspection for surface deficiencies is done in this custom-built wet-blasting unit. The equipment was built by the Cro-Plate Co. and uses high-velocity transfer of a fine abrasive suspended in water in a constantly agitated state through aspirator jet guns. It produces a clean, velvet-smooth surface in place of the baked-on composition of lead sulphate and lead oxide resulting from high temperature operation

Orders for U. S. MachineTools

representatives of the British machine-tool industry, and government people. The duty of these teams is to keep approvals of requests for new machines to a minimum and yet accomplish the production objective.

Mr. Rawson stressed that the British machine-tool industry is now as closely geared to defense production as it can be short of an all-out world war, when all economic considerations must be discarded. While exports still run to 35% or more of total output, most of the orders are for the defense efforts of British commonwealth nations as well as of continental European countries. Whatever non-defense domestic business is being booked is subject to diversion to a defense plant if that action should be necessary.

• **Realizing the heavy defense load** on the American machine-tool industry, the British are constantly reviewing their own needs with an eye on lightening their requirements from this country. In line with that objective, some 500 machine tools on order here have recently been cancelled and the orders transferred to other sources, Mr. Rawson revealed.

Mr. Rawson made no attempt to hide the fact that the British still are exporting some machines of the same types and sizes as they have on order here. He defended this practice on the basis that his country must export to live and that much of the business is for the defense of British Commonwealth nations and their allies.

The British are concerned over the placing of U. S. machine-tool orders in western Germany, fearing that deliveries promised to London may be pushed back, Mr. Rawson said.

This is Mr. Rawson's second visit to Washington since his appointment as director-general. While in this country, he visited a number of U. S. machine-tool builders having British orders. James Buchanan, export director of Wickman, Ltd., Coventry, is the representative of the director-general's office in Washington. He is on temporary leave from Wickman.

PLANTS EXPANDED

Macklin Co., Jackson, Mich., manufacturer of grinding wheels, is nearing completion of manufacturing facilities which will increase production capacity by 35%.

Precision Shot Co., Birmingham, Mich., has completed expansion of facilities for its Shot Peening Div.

U. S. Electrical Motors, Inc., will build a $3.5 million plant in Orange Country, Calif., providing a 50,000-sq ft administration building and 250,000 sq ft of covered manufacturing area.

Caterpillar Tractor Co. has announced an expansion program that will include a new factory in York, Pa., extensive additions to the Joliet, Ill., plant, and some improvement in the Peoria, Ill., plant. The major portion of the program will be financed with a long-term loan of $35 million.

Shepherd Special Machine & Die Co., Cleveland, is adding to its factory manufacturing space, including new engineering and general offices. The company has purchased the plant property at 15215 Chatfield, Ave., Cleveland.

American Stock Cars Take Eight Places in Mexican Race

MEXICO CITY (McGraw-Hill World News)—American stock cars made a good showing in the recent Pan-American Highway race run from border to border in Mexico, taking all of the ten prize-winning places except the first two.

First and second places went to two Italian Ferrari's, but the Ferrari is a $17,000 racing sedan, hardly in a class with American stock cars. A 1951 Chrysler Saratoga took third.

• **Sensation of the race** was fourth-place winner Troy Ruttman of Pomona, Calif., driving a second-hand 1948 Mercury with a special racing head. Nobody conceded Ruttman a chance against over 100 of the biggest and fastest (and most expensive) cars built. In fact, they rather doubted that a car three years old could drive the almost 2000 miles of rugged mountain terrain at the prescribed minimum speed of 65 mph average. All other cars in the race were 1951 models.

Ruttman and his co-pilot, Clay Smith, one of California's better hot-rod mechanics, went out two weeks before the race and bought the '48 Mercury for $1000. Putting about $200 more worth of new parts into the car, they tore the original motor apart and re-bored the original block for over-size cylinders of 3-5/16 in., which is about 1/20th more than they were.

Then they put Edelbrook racing heads on each side of the V-8, as was permitted under race rules (which banned tinkering with the cam, but permitted other minor changes.) The new heads gave a high compression of 7.75:1, and were finned to give better heat dispersion.

They then put on dual racing carburetors made by Evans, and a special Ford distributor which gives a hotter spark from an over-size generator.

In this manner they got about 115 mph top speed out of the car. Smith said the car never even got overly hot once, and there was no mechanical trouble during the race.

• **The Mercury was out in front** of the field for most of the race. However, as the road straightened out north of Mexico City and long straight-away stretches appeared, sheer power began to tell. The two Ferrari's and a Chrysler Saratoga driven by William Sterling moved up. Ruttman still led at the end of the fifth lap. But on the sixth lap the others caught and passed him, and from then on the four cars battled it out in front of the field.

On the last two laps Tony Bettenhausen, AAA stock-car champion, pushed his Chrysler Saratoga to a new world's stock car speed record of 113 mph, but previous brake trouble in earlier laps kept him out of the over-all prize money. He hit a 110 mph average on the 186-mile Parral to Chihuahua lap to break the old record of 103 mph, and then he went on in the final lap of 230 mph for his 113-mph record.

• **First ten cars out** of a field of 102, with the time for the 1933 miles, is as follows:

(1) Ferrari, 21:57:52; (2) Ferrari, 22:05:56; (3) Chrysler, 22:13:46; (4) Mercury, 22:18:03; (5) Packard, 22:22:17; (6) Hudson, 22:41:40; (7) Cadillac, 22:52:43; (8) Lincoln, 23:04:06; (9) Oldsmobile, 23:12:29; (10) Nash, 23:12:49.

Frank W. Smith

James H. W. Conklin

William M. Black

Warren G. Rosendahl

Names in the News

Frank W. Smith, vice president, Grinding Machine Div., Norton Co., Worcester, Mass., has retired after 33 years with the firm. He will remain with Norton as a consultant responsible for construction of the company's new $6-million machine division expansion, but will relinquish all responsibility for operation of the division to **Everett M. Hicks,** manager. Mr. Smith was made a vice president and director in 1946.

John L. Fuller has been named to the newly created administrative post of manager, Research & Technical Services, Reliance Electric & Engineering Co., Cleveland.

Thomas G. Lanphier has been elected vice president of Consolidated Vultee Aircraft Corp., San Diego, Calif. He joined Convair in April as assistant to the president.

Henry A. Denny has been named production manager, Engineering & Construction Div., Koppers Co., Inc., Pittsburgh. He succeeds **Frank Chambers,** resigned.

Joseph A. Richter, Jr., former chain saw specialist in the Market Requirements Dept., Henry Disston & Sons, Inc., Philadelphia, has been named manager of service, Power Tool Div.

Edward A. Green has been named manager of product planning of General Electric Co.'s Small & Medium Motor Dept. He was staff assistant to the general sales manager, Small Apparatus Div., Lynn, Mass. **Richard T. Walsh** has been named superintendent of the GE's Chemical Div. Coshocton, Ohio, plant.

James H. W. Conklin has been named general sales manager of the Philadelphia Div., Yale & Towne Mfg. Co., succeeding **James P. Kinney** who is taking over Yale & Towne's distributorship in Los Angeles and southern California. Mr. Conklin joins Yale & Towne from the sales department of Pangborn Corp., Hagerstown, Md. For several years previously he was sales manager, Industrial Truck Div., Clark Equipment Co. He is a past president of Materials Handling Institute.

William M. Black has been named president, and **Joseph L. Mullin** vice president, Electro-Alloys Div., American Brake Shoe Co. **Walter G. Hoffman** formerly president of Electro-Alloys Div. was named assistant to the vice president for research & development of American Brake Shoe. Mr. Black is a vice president of American Brake Shoe and also president of American Manganese Steel Div.

Ralph H. Rund, assistant factory manager, North American Aviation, has been named manufacturing manager. Other promotions: **Gary Stroh,** general superintendent, assembly and flight operations, Los Angeles; **W. F. Snelling,** general superintendent, manufacturing activities, Long Beach and Downey; and **D. C. McMillan,** superintendent in charge of production control. **Lewis S. Wait** was named general administrator of a new modification plant at Fresno, Calif., and **Thomas L. Regan** was named superintendent there.

William A. Cannon has been named general manager, Columbia Machine Works, Berkeley, Calif.

Warren G. Rosendahl has been named assistant general manager of its new Hamilton Div., Clearing Machine Corp., Chicago. He was formerly an officer of Hamilton-Thomas Corp., from which Clearing recently purchased the plant it now occupies in Hamilton, Ohio.

R. B. Blythe has been named executive chief engineer of the Bryan plant, Aro Equipment Corp., Bryan, Ohio. He was formerly sales manager, Aircraft Div., where he has been succeeded by **J. R. Markey** of the Aircraft Sales Div. and the management committee.

Henry V. Ivory has been named plant manager of National Electric Products Corp's newly purchased million-dollar plant at Elizabeth, N.J. Prior to his new connection, he was at Picatinny Arsenal in charge of mobilization planning.

L. H. Bender, previously general supervisor, manufacturing control, has been named superintendent of manufacturing control and contract administration for Luscombe Airplane Corp., Dallas. **W. A. Tweedie,** former chief industrial engineer of Texas Engineering & Mfg. Co., Inc., Dallas, was named factory manager of Luscombe Airplane Corp., Temco subsidiary at Garland, Texas.

William L. Parlon has been named general manager of Elbeeco, Inc., subsidiary of Aeroquip Corp., Jackson, Mich. He joined Aeroquip in June 1951 as a project engineer.

Oscar E. Maston, former Pratt & Whitney Aircraft executive tool engineer in charge of production engineering operations, has been elected vice president and manager of Associated Engineers, Inc., Agawam, Mass.

Top state officials greet executives of Rockwell Mfg. Co., Pittsburgh, at the dedication of the company's new plant at Tupelo, Miss. Left to right are Gov.-elect Hugh L. White, Governor Fielding Wright, H. Campbell Stukeman, vice president, and Col. W. F. Rockwell, chairman of the board

Joseph L. Armstrong has been appointed manager of the air conditioning sales section, Crosley Div., Avco Mfg. Corp., Cincinnati. He was formerly field sales manager, Bendix Home Appliances.

Joseph X. Cox, designer of the Ignitron rectifier, has been promoted to engineering manager of the Sunnyvale, Calif. plant of Westinghouse Electric Corp. He was previously supervisor of electrical engineering and quality control for the Sunnyvale plant. He joined Westinghouse as a service engineer in 1923.

Don S. Smith has been named vice president-charge of production, Wellman Bronze & Aluminum Company. He was formerly production manager for the company.

Charles B. Bunch has been named manager of the Dayton office, Ai-Research Mfg. Co., Los Angeles. He succeeds Harry H. Wetzel who was transferred to the company's Phoenix, Ariz. plant as sales and service representative.

William W. Fuller has been appointed purchasing agent Cleveland Chain & Mfg. Co. He was formerly an industrial engineer for the American Steel & Wire Co.

Lester M. Carroll has been appointed assistant sales manager, Chicago office, Dayton Rogers Mfg. Co.

Nelson S. Cobleigh has been appointed district manager, Philadelphia sales division, Ampco Metal Inc. Milwaukee.

Charles E. Nelson, Jr. has been elected to the board of directors, Waukesha Motor Co., Waukesha, Wisconsin. Mr. Nelson is also vice president-production and has been with the company since 1929.

Kenneth W. Donle has been appointed chief metallurgist, Tube Reducing Corp., Wallington, N. J. Mr. Donle has been associated with the company since 1939 and was previously assistant chief metallurgist at the company's Gary, Ind. plant.

John F. Ansink has been elected vice president, Round Chain & Mfg. Co. Chicago. Mr. Ansink has been general manager of the company since its formation two years ago and will continue in that capacity.

Dr. J. O. Hendricks has been named to the newly created post of associate director, central research laboratories, Minnesota Mining & Mfg. Co., St. Paul, Minn. Mr. Hendricks has been with Minnesota Mining since 1936.

L. L. Meikel has been elected president of the Lincoln Engineering Co. of Calif., a subsidiary of Lincoln Engineering Co., St. Louis. He succeeds **C. Homer Redd.**

OBITUARY

Chester S. Ricker, 63, Detroit associate editor of AMERICAN MACHINIST for the past six years, died Dec. 5 in Grosse Pointe, Mich., from complications following a series of operations. He had been in excellent health until two months ago—in fact, had recently completed a coast-to-coast trip by automobile.

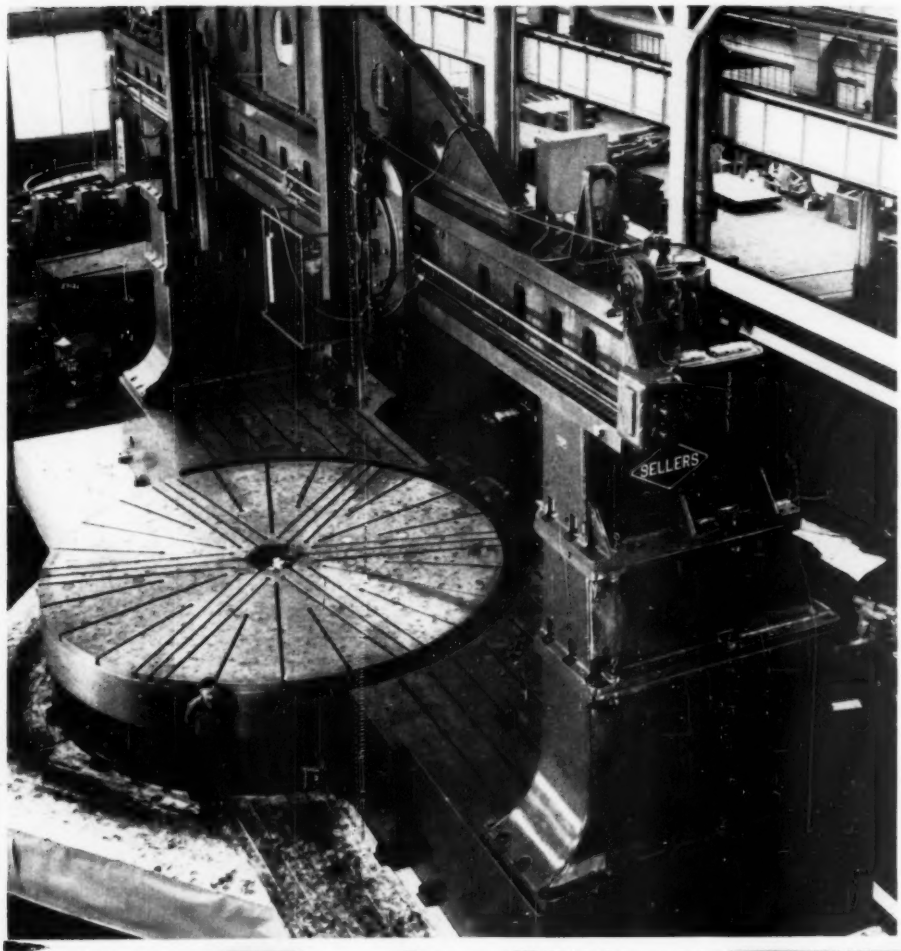
Mr. Ricker was in many respects a fabulous character. He was born in Cochituate, Mass., and became interested in auto racing while a student at Cornell. He devised a timing system for races while still a student, and timed the first Indianapolis race in 1911, the year of his graduation. He has since timed all Indianapolis races, as well as humming birds and the Harmsworth and Gold Cup motorboat races on the Detroit River. He picked places by a point system, even using a sextant to determine that Jimmy Snyder reached 180 mph on the backstretch at Indianapolis the day he had a 130-mph average.

Mr. Ricker built the first 16-valve, 4-cyl, T-head engine in the country for the Stutz ("Bearcat"), was with Marmon, Stutz, National Lexington, Midwest Engine, and Waukesha Motor as consulting engineer. For ten years he was technical counsel on the Ford and Standard Oil accounts. During World War II, he was associate editor on "Wings," published for the Army Air Forces and the Navy Bureau of Aeronautics, thereafter came with AMERICAN MACHINIST. His perspective sketches of design details were a masterful job in both magazines, as well as in his engineering reports.

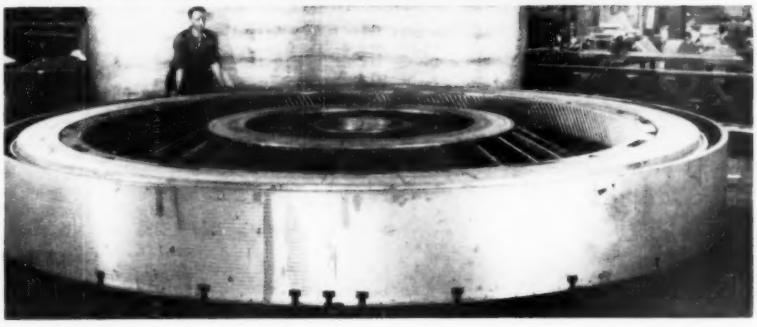
He was a member of the SAE, ASTE, Institute of Aeronautical Sciences, Tau Beta Pi, Engineering Society of Detroit, and vice commodore of the Gold Cup Committee.

Chester S. Ricker

New Shop Equipment



This 42-ft boring mill has 20-ft table, will be set into the floor within 4 in. of table top and surrounded by floor plates



Inverted table shows two Formica ways and large internal gear

Materials and Parts

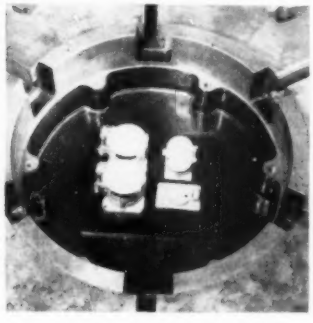
Giant Sellers Boring Mill For General Electric

Floor area	43 x 57½ ft
Depth below floor	10 ft
Height	36½ ft
Height over floor	32 ft
Between housings	42 ft 2 in.
Heights under toolholder	4 ft, 8 ft, 10 ft 6½ in., 14 ft 6½ in.
Weight	700,000 lb
Table weight	160,000 lb
Crossrail weight	99,000 lb
Crossrail length	58 ft
Crossrail width	48 in.
Table diameter	20 ft
Max workload on table	82 tons
Vertical spindle travel	9 ft
Table speeds	¼ to 10 rpm
Feeds	0.015 to 1.54 ipr
Power traverse	72 ipm

With special flexibility for handling large diameters and heavy tonnages, one of the largest machines of its type installed in this country is this 42-ft Sellers vertical boring and turning mill for General Electric Co., Schenectady, N. Y., for machining hydro-generator frames and other parts. When work is too large for the table, cross-rail and block-type uprights may be removed to provide still greater swing.

In this case, work would be set up on the bed or floor plates surrounding the machine, while tools are mounted on stands on the revolving table. In this case, also, the machine can be controlled by a portable pushbutton station plugging into the table center. This permits the operator to ride inside, close to the work. Plug-in power outlets at the table center also permit mounting smaller machine tools inside for special jobs.

Table has center outlet boxes for power and control leads



Normal control is from the usual portable pendant stations, adjustable for use from the floor or from the rail-head platforms. The machine carries speed indicators and horsepower meters for maximum efficiency in operation.

Guaranteed accuracy of the machine is to turn, bore and face within 0.001 in. for the total distance of machine capacity. The table is centered by large Timken bearings to run true within 0.001 in.

Table tracks of Formica are pressure lubricated — actually flooded with oil so the table runs on an oil film—with interlocks so the machine shuts down automatically if lubricant pressure drops below the required level. All lubricant is filtered before it enters bearings. Less than 5 hp are required to rotate the 20-ft table at low speeds without load, and the drive is so smooth that the coupling can be rotated by hand. Table speeds are infinitely variable from ¼ to 10 rpm, feeds from 0.015 to 1.54 in. per rev. The table is driven by a 100-hp adjustable-voltage drive operating over a range of 160 to 1600 rpm with only one gear change necessary. The two feeds are each powered by a 10-hp General Electric Thy-mo-trol drive with a speed range of 23 to 2300 rpm.

The bed of the machine is in five pieces and the table in two to permit machining and shipment. Table and driving gear weigh about 60 tons, the entire machine 350 tons, making total load on the foundation about 425 tons. The foundation, started about six months ago, is 60 ft wide, 40 ft front to back, and is about 1000 tons of steel and concrete. Preliminary work and building of forms required four months, curing the poured concrete is taking two months more. Seven or more rail cars will be required for shipment.

Consolidated Machine Tool Corporation, Rochester, N. Y.

...INCLUDING

Portable hydraulic power unit modernizes old machine tools — providing up to 2000 psi and 60 gpm page 150

Milling machine is so sturdily built that it can be used at the maximum speeds of carbide cutters page 152

Hobber has two improvements that extend tool life and reduce setup time page 154

Soldering and brazing unit deposits lead and tin-base solders at 200 fpm page 154

Electronic servomechanism remotely accurately positions a dial pointer or pen page 156

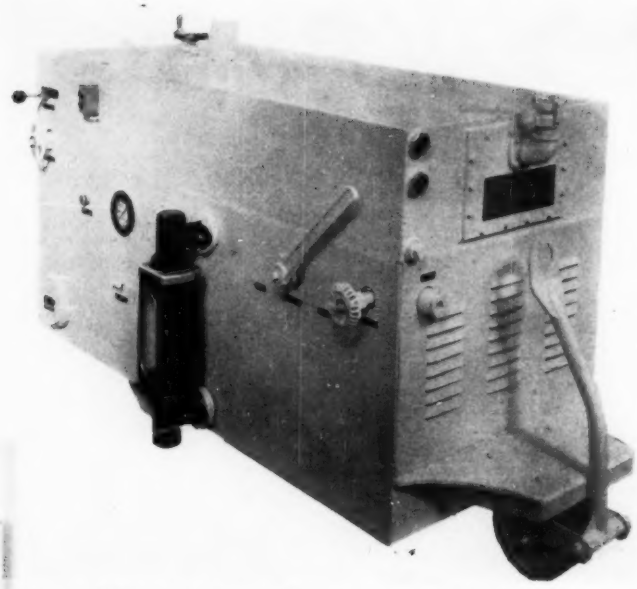
Self-indexing bed turret has a mechanism which is linked to automatic stop rods page 158

Universal hand hone has an attached oiler with finger-tip control, any grit-size honing stick available page 160

...and in January 7

Profile projector for the inspection of turbine blades uses a new principle to obtain sharp delineation of blade edges.

German lathe has a quick change gear box allowing 49 longitudinal and cross feeds. It also has a twin-slide carriage and a hydraulic-copying attachment.



Portable Hydraulic-Power Unit Modernizes Old Machine Tools

This unit provides hydraulic power for testing purposes and for modernizing old equipment—especially machine tools and processing machinery. It can be towed and used wherever electric power is available.

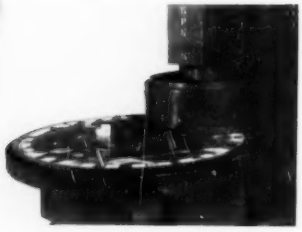
Fixed-volume pumps in the unit provide up to 60 gpm at 2000 psi. Handwheel and pressure-compensated controls enable users to meet specific needs up to 5000 psi and 5 hp.

Multiple-valve combinations and simple hand control of two pressure lines permit the pump to take suction from a built-in 100-gal. tank or from an outside source—a wide variety of test patterns can thus be set up.

The unit has micronic filter; built-in relief valve; flowmeter; pressure gages; and electric controls — all mounted in a heavy steel frame and built to meet JIC specifications.

The unit shown is 75 hp, developing 32 gpm at 3000 psi. Weight is approximately 3750 lb.

The Rucker Co., 4228 Hollis St., Oakland 8, Calif.



Double-Spindle Grinder for Finishing Thin, Flat Parts

A double, vertical surface grinder from Gardner Machine Company is said to be adaptable for a wide variety of parallel surface work.

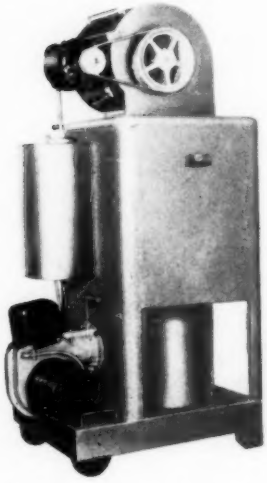
The vertical column mounted on a sub base is provided with ball-bearing ways on which the two grinding heads, and headslides move with ease. The heads have a tilting feature allowing the 23-in.-dia abrasive disks to be set to the angle for best grinding results.

Head movement is controlled by handwheels located on the side of the column. A similar handwheel actuates the dresser.

The power-driven rotary work carrier is located on the front of the sub base. Guides are provided to properly locate the workpieces while entering between the abrasives and to keep them properly located when leaving.

Parts are hand-loaded into the rotating carrier and unloaded automatically by gravity. On the ceramic part shown, measuring approximately 2 in. square, production averages from 30 to 40 pieces per minute, removing 0.008 to 0.010 in. over-all stock, and maintaining tolerances of 0.0005 in. for parallelism and 0.0015 in. for uniformity.

Gardner Machine Co., Beloit, Wis.

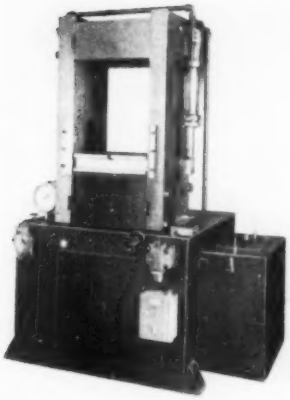


140,000-Btu Heat Machine for Indoor or Outdoor Use

A 140,000-btu head machine is reputed to employ a new principle of forced-air circulation. It blows warm air out of the machine's base along the floor, creating a 6-ft-high heat blanket and eliminating the necessity for heating vast overhead areas in order to keep workers comfortably warm. This concentration of heat is said to reduce heating cost by as much as 90%.

Unlike ordinary conventional heaters, Model PW-140 sprays heat from all sides across the floor. Consequently it can be advantageously located in the center of a large area. It is designed to comfortably heat workers in areas up to 3000 sq ft of confined space or 1600 sq ft of open space. The unit burns regular furnace fuel oil of No. 3 or lighter grades of kerosene. It requires no flue or chimney. Self-contained, it has an attached 6-gal fuel tank and is equipped with wheels for easy portability as a hand truck. Dimensions are 21x33x53 in. The machine weighs 245 lb. Burner is UL-approved gun type, pressure atomizing.

Fageol Heat Machine Co., 5725 Mt. Elliott Ave., Detroit 11, Mich.

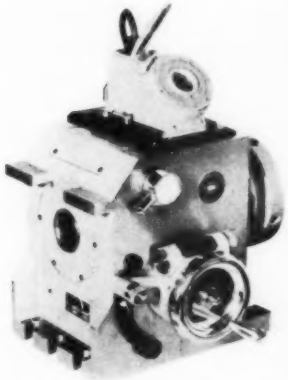


High-Pressure Hydraulic Press

Not designed for high-speed operation, this low-cost press finds use in small-lot production where very high pressures are required.

The up-moving platen is power returned with two push-back cylinders. The hydraulic circuit uses a high-volume pump for rapid advance, a low-volume, high-pressure unit for the actual pressing, and a pressure regulator. The machine is manually operated with control of pressure in the power direction by an auxiliary control. Capacities are 200, 400, 500, and 600 ton.

M & N Machine Tool Works, 287-293 Allwood Rd., Clifton, N. J.



Fixed Base Added to Improved Griswold Optical Dividing Head

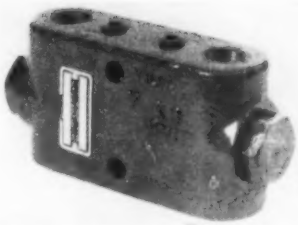
The Griswold Optical Dividing Head with a fixed base was developed for use in inspection applications and as a production tool. It can be used for checking angular dimensions such as the spacing of spur gear and ratchet teeth, measuring eccentricity and contours of cams and other shapes, etc., and for use on machine tools where precise positioning is required in either a horizontal or vertical plane.

The unit is said to afford an order of accuracy in direct-reading measurement, considerably higher than that obtainable by mechanical means. Measurements are made optically by alignment of visible scales, thus accuracy is independent of mechanical wear, etc. Any one of a series of measurements is reproducible regardless of direction of spindle rotation.

For measurements made on the periphery of a 12-in.-dia circle the head will hold and repeat settings to within 0.0005-in. chordal-line distance.

The optical system consists of a circular dial marked in 30-sec divisions and an illuminated glass scale on which degree marks from 0 to 360 are etched. These degree marks are projected onto a ground glass screen and aligned between two reference marks on the screen. Readings are made at normal eye level.

F. T. Griswold Mfg. Co., 305 W. Lancaster Ave., Wayne, Pa.



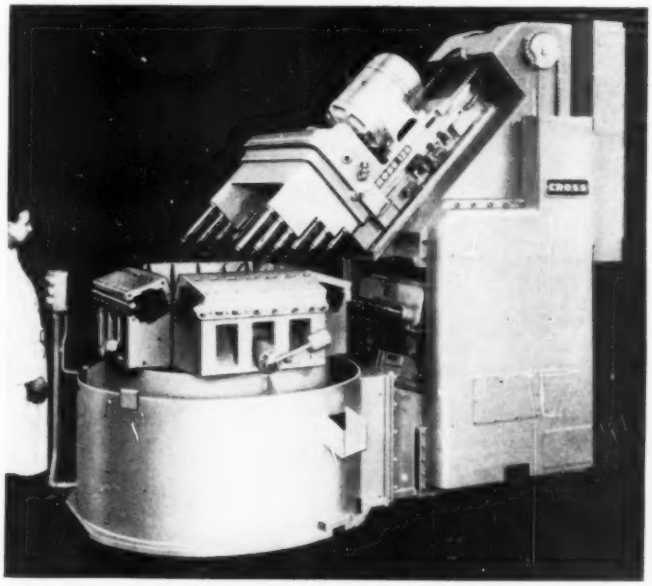
Automatic Flow-Regulating Valve Eliminates Hydraulic Voids

This flow regulator eliminates hydraulic voids where, in lowering heavy loads, the operating cylinder tends to lower faster than a pump can supply oil to it, or in a system where linkage is such that over-center operation is involved.

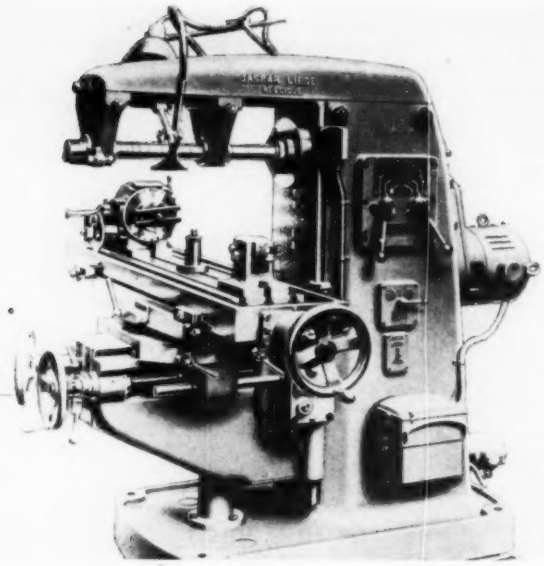
Designed for double-acting cylinders, the 450-series valve regulates the flow of scavenger oil from double-acting cylinders at the same rate as oil is supplied by the pump to the power side. It thus eliminates any void and loss of control.

The valves are available in capacities up to 25 gpm at 1000 psi.

The Hydraulic Equipment Co., 1100 E. 222nd St., Cleveland 17, Ohio



TRANSFER MACHINE drills 12 angular holes and countersinks 8 manifold mounting holes in 170 pieces per hour at 100% efficiency Only one unskilled operator is required. A fluid motor drive prevents damage to the table under improper loading conditions. It is simple to reverse the rotation, remove the obstruction and continue the operation. The machine is composed of standard Cross sub-assemblies to facilitate maintenance, reduce downtime and provide for part-design change — *The Cross Co., Detroit 7, Michigan*



Jaspar (Belgium) Milling Machines

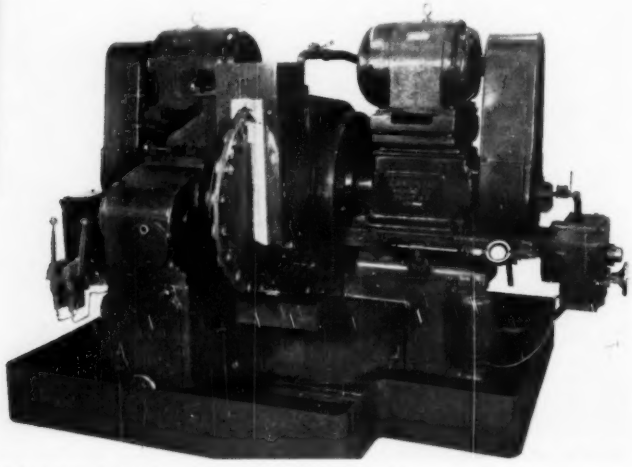
These Belgian-made milling machines are made in a range of models, both vertical and horizontal, in No. 2 and No. 3 sizes. The universal model has, in most instances, climb-milling attachments.

They are claimed to be so heavily and sturdily built that they can be used at the maximum speeds of carbide cutters. A separate motor is used for table feed.

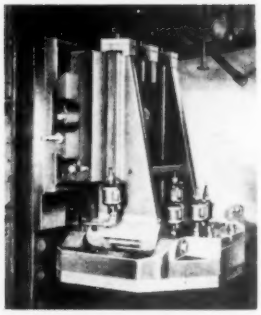
No priorities are necessary for these machines.

Importer is

Morey Machinery Co., Inc., 410 Broome St., New York 13, N. Y.



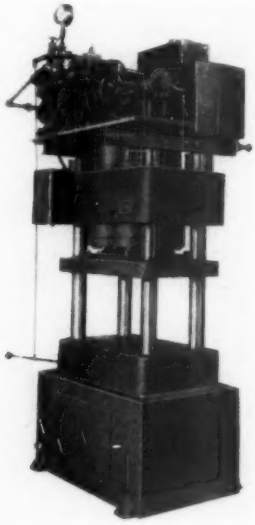
DOUBLE-SPINDLE GRINDER finishes both ends of bearing rollers in one operation. The heads may be pivoted to the best grinding angle. An attachment on the front drives the rotary work carrier at a variable speed within a ratio of 3 to 1. The carriers are interchangeable—permitting a variety of work sizes. Two pairs of micrometer-adjusted guides locate the work while entering and leaving.— *The Gardner Machine Co., Beloit, Wis.*



Thread-Rolling Attachment for Bullard Mult-au-matic Machines

These are successfully rolling 4¾ in. x 12 threads. Other sizes of smaller or larger diameters can be successfully produced by this method. The attachment mounts on a standard cross turning slide and is operated by normal procedure. Threads can be rolled to one thread of a shoulder, and pitch tolerances can be held to 0.001 in. Concentricity of threads to other turned dimensions are maintained.

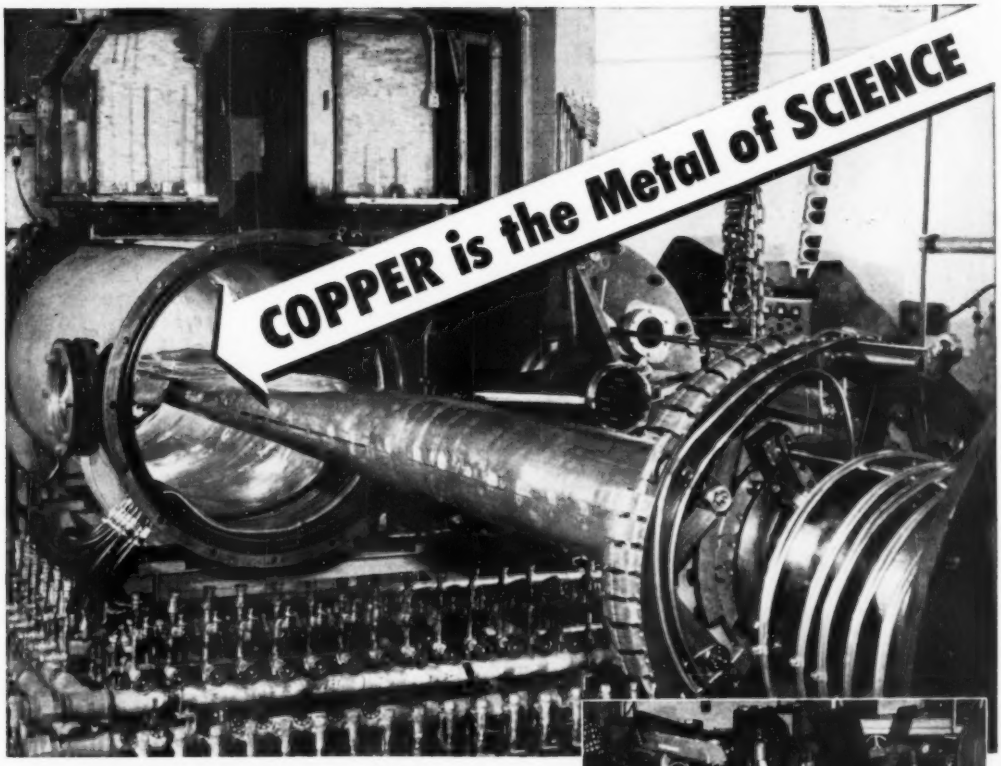
Salvo Tool & Engineering Co., 26441 Gratiot Ave., Roseville, Mich.



Down-Acting Hydraulic Press

The Model 0385 is designed for forming and bending heavy steel plate, drawing in heavy metals, etc. It utilizes a dual-pump hydraulic system, which is power actuated in both directions.

M & N Machine Tool Works, 287-293 Allwood Rd., Clifton, N. J.



D and D Stem being inserted in Cyclotron; made of Revere Electrolytic high-conductivity copper, hot rolled and annealed, ⅛" thick. Note also large number of bronze valves to control flow of cooling water through brass pipe.

● For many years Revere has been saying that "Copper is the metal of invention." It has high electrical and heat conductivity, excellent resistance to corrosion, is easily fabricated and formed, so that it is attractive to designers and inventors, as well as to manufacturers. Now we say it is also "The metal of science," because it is so essential to the operation of most scientific devices.

The pictures on this page illustrate some of its uses in a cyclotron, built by and for the Nuclear Physics Laboratory of the University of Washington in Seattle. The instrument was designed and constructed so far as possible by University personnel, who were completely successful in working copper into the most complicated shapes.

Revere collaborated on the project in various ways, and furnished copper bar, sheet, rod and tube to the University's high specifications. Remember that Revere will be glad to consult with you on your problems concerning copper and copper alloys, and aluminum alloys.

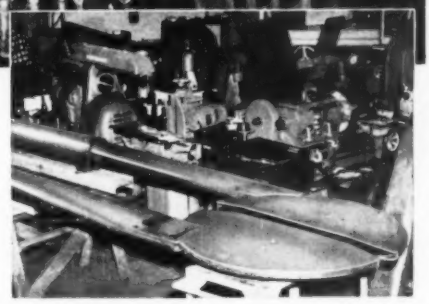
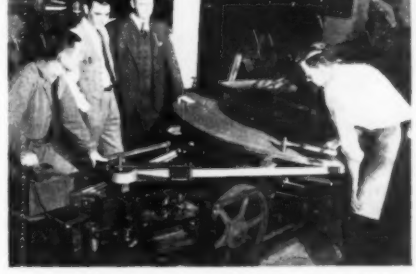


Photo taken in the University of Washington shop during fabrication of the two Ds and D Stems.



Seven miles of Revere copper bus bar were wound into great coils for the cyclotron electromagnet. The University built the winding machine itself, and wound the coils in its own shop. The special Revere bar is soft temper, free from scale, with rounded edges.

REVERE 150th YEAR OF SERVICE TO AMERICA

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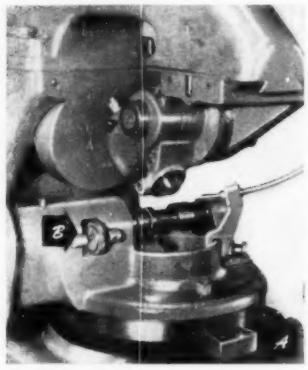
Soldering and Brazing Unit for Labor and Material Savings

The unit, called a Mogul soldering or brazing gun, is said to be adaptable to any type of manufacturing where soldering or brazing is required and is completely suited to special soldering jobs as well as production runs.

The gun is built to deposit lead and tin-base solders and also silver solders and other brazing wires, in a liquid or semi-liquid form to a part moving at a constant speed under the gun nozzle. Soldering or brazing can be either intermittent or continuous at any desired rate of speeds. Speeds of up to 200 lineal feet of seam per minute are permitted. It will supply spot soldering material in any desired quantity which can be deposited to a pinpoint location. This material in wire form is fed into the center of a conical flame where it is melted into a liquid or semi-liquid state depending upon requirements and then deposited into the seam being brazed.

Metallizing Co. of America, 3520 West Carroll Ave., Chicago 24, Ill.



Hamilton Hobber Improved for Making Small Precision Gears

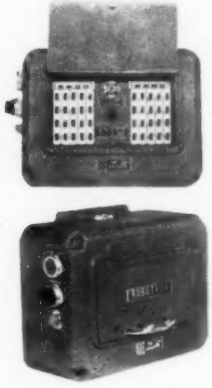
The Hamilton No. 1 Gear-Hobber has been redesigned to extend tool life and reduce setup time. The added improvements cut costs.

The first change shown at *A* on the photograph is a vernier to measure minutes of the degree on the turntable scale. The added ease with which this accuracy is attained at this point is said to substantially reduce setup time, thus reducing costs.

The second improvement shown at *B* is a knurled thumb wheel which provides an accurate and rapid means of positioning the hob relative to the workpiece. This device also helps to speed setup and provides further advantage of greatly extending the periods of hob use between sharpenings, and thus increasing hob life and reducing costs.

Ruthman gusher pumps are now used on the hobber for the circulation of coolant. The coolant system is now operated through controls independent from other parts.

The Hamilton Tool Co., Hamilton, Ohio

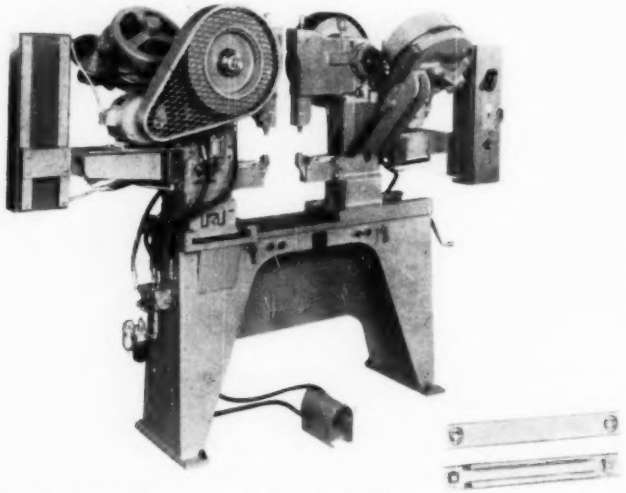


Automatic Cycle Controllers For Press Bumping Operations

This automatic cycle controller in Robotron line is said to be particularly suited to applications in the rubber and plastics industries where press bumping or breathing is essential. It is capable of accurate timing and close control of press opening distance and features pushbutton keyboards to set up cycles in a few seconds.

A complete package unit, it includes operating pushbuttons facing the press operator, lockable keyboard cover at the side, solenoid valve and internal-pressure switch. Rugged electrical-control elements, without electronic tubes, contribute to low maintenance and high dependability.

Emmett Machine & Manufacturing, Inc., 2249 — 14th St., Akron 14, Ohio



DOUBLE-CLINCHER UNIT is tooled to feed and set two 3/8 × 1 2 × 3/16-in. thick Fabri-Steel nuts at each operation. The anvil position of the left clincher is adjustable in a front-to-back direction, and also with respect to height. The right unit is adjustable in a left-to-right direction. Both units are tripped by the same foot-operated valve. — *Tompkins Johnson Co., Jackson, Mich.*

Get the most out of your
LELAND-GIFFORD
DRILLING MACHINES

use *AIR* with care

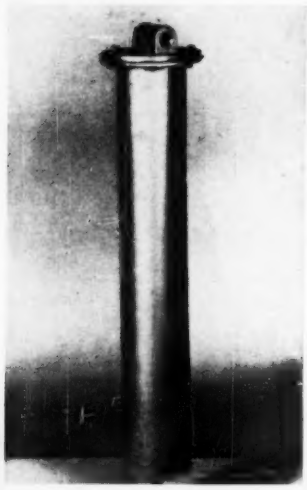
Careless use of compressed air in cleaning the machine or clearing the work can result in blowing chips, dirt or grit onto the quill, rack, crosshead or other precision fitted surfaces. Use air with care and your Leland-Gifford Drilling Machines will continue to deliver the faultless precision performance for which they were designed and built.

A small point? Yes . . . but important! Leland-Gifford Drilling Machines are built as trouble-free as master craftsmanship and long experience can make them . . . with totally enclosed motors, spline lubrication wipers, oil mist lubricated spindle bearings and many other features to insure lasting precision and safe, dependable operation. But neglect or abuse can impair the performance of even the finest equipment. With reasonable care and maintenance, your Leland-Gifford Drilling Machines will keep on producing accurate holes year after year. Remember, you are making a valuable contribution to the defense effort when you take the best possible care of your production equipment.

SAVE TIME — **CONTACT THE OFFICE NEAREST YOU**

LELAND-GIFFORD
Drilling Machines

WORCESTER 1, MASSACHUSETTS, U.S.A.



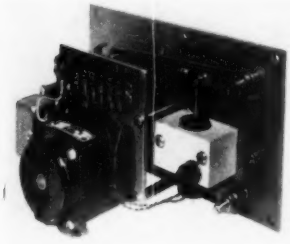
Condensing Filter Removes Water from Air Line

The outer shell on this filter is 6 in. in dia by 36 in. long and it encloses a steel inner cartridge 5 in. in dia by 24 in. long, loosely packed with Fiberglas.

A cast-aluminum head with inlet and outlet openings is bolted to a flange welded to the outer shell. Air enters the inlet opening and passes down between the inner and outer shells. Expansion of the air and an extensive cooling surface cause any moisture that is in the air to condense and fall to the bottom of the outer shell where it is discharged through the drain valve. The air then passes through the Fiberglas and the inner cartridge, which baffles out any remaining moisture without reducing the line pressure.

Because the Fiberglas is non-absorbent, the filter requires no servicing except frequent draining to get rid of the accumulated water and oil.

Air-Line Engineering Co., 4758 Warner Rd, Cleveland, Ohio

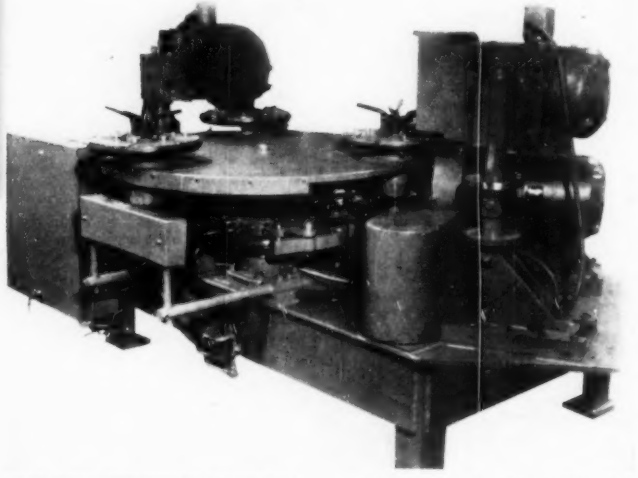


Electronic Servomechanism For Remote Positioning

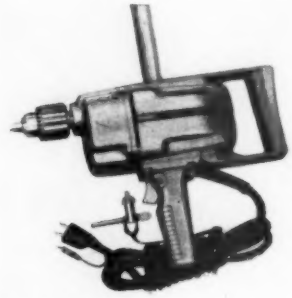
An electronic servomechanism has been developed to remotely position a dial pointer, recorder, pen, mechanical counter, etc. with high accuracy.

The unit employs an electrical null-balance differential transformer measuring system being actuated by a two-phase low inertia motor. Continuous null-balance operation is unaffected by line-voltage variations of ± 10%. The unit has a full-range rotation in 2, 4 or 10 seconds instantaneous-output shaft movement per change, dead-beat non-cyclic response. Sensitive, it has approximately 5,000 motor-driven output shaft positions with an accuracy of ± 0.2% full range of output shaft. Range is 333-1/3° shaft rotation. Output shaft develops 15-oz-in. force with 2-sec response, 30-oz-in. with 4-sec response and 60-oz-in. with 10-sec response. The mechanisms are available in right- and left-hand assemblies.

Automatic Temperature Control Co., Inc., 5200 Pulaski Ave., Philadelphia 44, Pa.



RING-GEAR DEBURRING MACHINE is arranged for one unloading and loading position and two brushing stations. Each brushing station brushes top and bottom of the gear teeth. Work cycle is 6 to 7½ seconds. The machine has automatic movements and is fitted with a time relay to adjust cycle timing. Production is approximately 525 gears deburred per hr. — *General Riveters, Inc., 785 Hertal Ave., Buffalo 7, N. Y.*



Electric Drills Cover Speed and Torque Requirements

These drills are built in different power and speed models to cover the speed and torque requirements in production, construction, and maintenance use of ¼-, ⅜-, and ½-in. capacity portable electric drills.

Compact, balanced, streamline design; body of aluminum die castings for combined strength and light weight; dynamically balanced armature for smoothest running; precision-cut, heat-treated alloy-steel gears, and adequate forced ventilation are some of the features of this line of Superduty drills. All models use ball and needle bearings throughout. The standard drill is furnished with a high-quality ⅜-in. capacity gear chuck and a 10-ft, 3-wire ground wire, rubber-covered cord with attachment plug.

Portable Electric Tools, Inc., 320 W. 83rd St., Chicago, Ill.

SIDNEY HEAVY DUTY LATHES

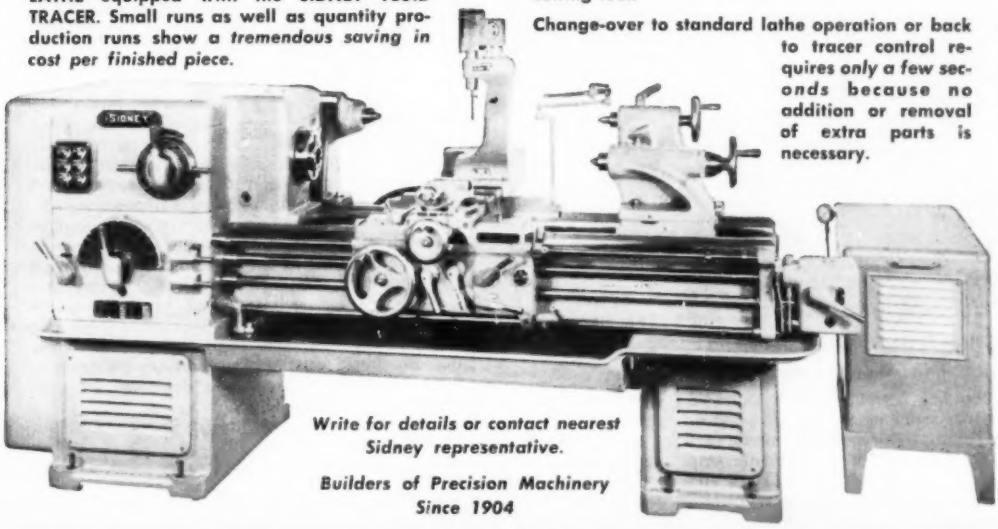
SOLVE YOUR PRODUCTION PROBLEMS

TURN ANY SHAPE .. ANY NUMBER .. FASTER .. MORE ECONOMICALLY

THE variety of shapes and sizes illustrated shows the versatility of the SIDNEY LATHE equipped with the SIDNEY FLUID TRACER. Small runs as well as quantity production runs show a *tremendous saving in cost per finished piece.*

The sensitive tracer head transfers every change in contour of the master piece or template to the cutting tool.

Change-over to standard lathe operation or back to tracer control requires *only a few seconds* because no addition or removal of extra parts is necessary.



Write for details or contact nearest Sidney representative.

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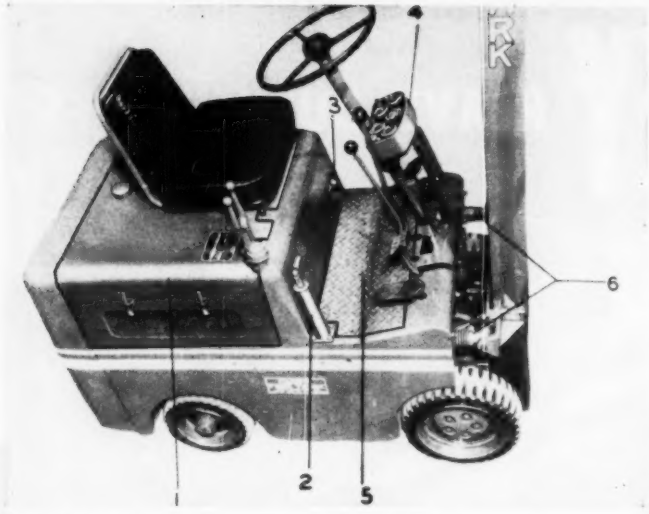


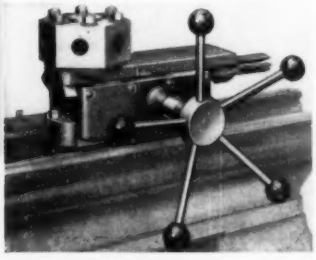
Easier Handling and Maintenance Feature Gas Fork Truck

Louvers on both sides of this truck hinge at the bottom and fold down to expose the engine compartment. To remove the hood and seat to get to the engine, it is only necessary to remove the radiator cap and air breather cap.

Improved steering is achieved by the use of an Elliot axle with the tie rods in the same plane and more nearly in line with the forces they transmit, plus relocation of steering knuckles as close to tire's dead-center shock point as is practical. Better riding is obtained by cushion tires and rubber torsional bushings at pivot mounting points.

Unscrewing two bolts and disengaging accelerator pedal allows fast accessibility to the clutch housing.

Clark Equipment Co., Industrial Truck Div., Battle Creek, Mich.



Self-Indexing Bed Turret Has 6-in. Slide Travel

This bed turret for most standard lathes swinging 9 to 12 in. features a sturdy, self-indexing mechanism which is linked to automatic stop rods. These limit stroke length and can be set for any requirement up to the full slide working stroke of 5¼ in. Total slide travel is 6 in.

The turret is guided in its rotation by a large-diameter pilot integrally cast which deeply engages a mating bearing in the slide. Flat bearing surfaces between ram and turret are hand-scraped for close fit. Due to its design the entire work load is applied to the pilot and flat bearing surfaces, resulting in rigidity and freedom from deflection.

No hold-down handle is required. A hold-down bolt applies an adjustable, pre-loaded pressure against a ball thrust bearing located on the turret base.

Saddle and ram bearing surfaces are unusually long and the heavy, dovetailed gibs not only provide full support on both sides of the ram but also permit easy centralization as wear occurs.

Hexagonal turret is provided with flat faces which accommodate flanged toolholders and which may be bored for straight shank tools. Ample turret stock permits boring standard 1-in. holes or even 1¼-in. oversize holes with no weakening of the walls. Long bars can extend completely through the turret.

Indexing is performed by a spring-loaded tapered pin sliding in a sleeve and engaging a mating tapered bushing in the turret. These parts are of hardened tool steel, finish ground. The tapers automatically take-up for wear and insure unerring accuracy of location.

Other features include a calibrated scale showing length of stroke, a tool clearance over ram of 3½ in. on 9- and 10-in. lathe models and 4 in. on 11- and 12-in. lathes, free-wheeling turret action backwards and forwards—if desired, and a 5-spoke pilot wheel for extra convenience.

Globe Heat-Seal, Inc., 3380 S. Robertson Blvd., Los Angeles 34, Calif.

Magnetic Coolant Separator From Sundstrand is Easily Installed

Designed for installation on many types of grinding, honing, and gear-shaving machines is a compact magnetic coolant separator now available from Sundstrand Machine Tool Co. The separator is completely automatic and its simple construction is said to minimize maintenance.

The separator cleans the coolant as the liquid passes under a revolving drum of solid Alnico which is permanently charged. The coolant is directly exposed to the magnetic drum without interference from non-magnetic insulators. Separated material is removed from the drum by a scraper and deposited in a receptacle.

Placed directly on top of the machine coolant tank, it requires little or no additional floor space or piping.

Over-all length, including receptacle for separated material, is 28 in. Height, including receptacle, is 23 in.

Sundstrand Magnetic Products Co., Div. Sundstrand Machine Tool Co., Rockford, Ill.

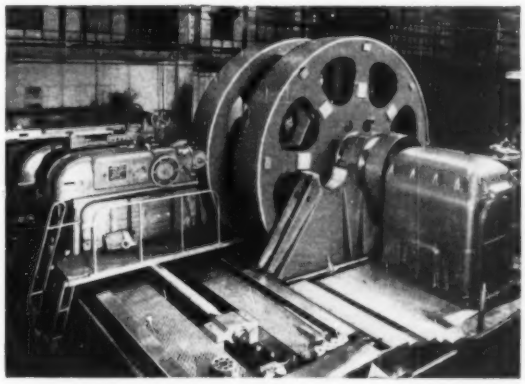
Precision Shaved Gears to Drive the.....

SS UNITED STATES

The largest, fastest, most luxurious ocean liner ever built in this country is an outstanding example of American know-how and initiative. Built by the Newport News Shipbuilding and Dry Dock Co., she carries the products of every state in the Union, including the finest mechanical equipment American industry can produce.

Among the important mechanical elements of the ship's propulsion machinery are the mammoth reduction gears made by Westinghouse Electric Corporation. To achieve the perfection of tooth surface required in these gears, they were finished on Red Ring Gear Shaving Machines.

These machines are built to shave gears of any size—from the smallest instrument gear to the largest marine gear.

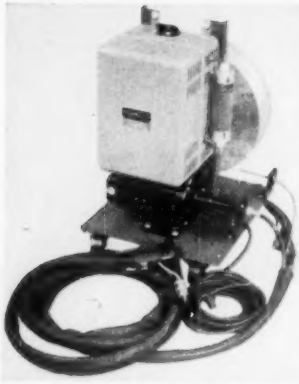


SPUR AND HELICAL GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORM

NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT



Operator Controls Flow on Fillerweld Alloy-Metal Welding

Used with gas-shielded arc welders, Fillerweld allows the operator to control the continuous flow of filler-metal automatically by means of a finger switch mounted on the torch. Also the flow of filler metal can be started or stopped without breaking the arc, resulting in a smoother, faster weld.

Fillerweld consists of two main elements—the torch or gun, and a mechanical power unit. The gun is basically a manual water-cooled inert-arc tungsten holder to which has been added a control switch, and a gear assembly for pulling the filler metal from the spool through the gun. Rated at 250 amp, the gun accommodates tungsten from 0.040 to 5/32 in. in dia and up to 7 in. long.

The mechanical power unit consists of a motor which provides the power for drawing the filler-metal, a Thy-mo-trol unit for controlling the motor, and a spool which holds the filler wire. The unit is mounted on a portable platform.

The operator presets the desired filler-wire speed by means of a rheostat located on top of the Thy-mo-trol unit. He then takes the gun just as if it were a normal inert-arc torch and strikes the arc. As soon as a molten pool has been established, the operator pulls the trigger on the gun and the wire feeds the arc. To stop the wire feed at any time, even during welding, the operator has only to release the trigger.

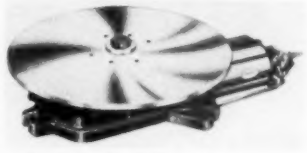
The equipment can be used with a GE Type-WP inert-arc welding transformer for welding aluminum, magnesium, or beryllium copper; or with a GE Type WD-4150 or WD-4200 for welding stainless steel, copper, inconel, steel, and other weldable alloys. Either argon or helium gas can be used.

General Electric Co., Schenectady 5, N. Y.

Universal Hand Hone for Cylindrical and Tapered Surfaces

Each of two sets of these hand hones are for OD ranges from ¼ to 3 in. The small-body Model FS2 is to be used for shorter lengths than the FL4. Any grit size is available in the honing sticks, so that close tolerances can be held. The manual operation eliminates screws or handles to remove or tighten in the control of work size, and the attached oiler has finger-tip control. The work is chucked in any lathe, drill press, or electric drill.

Universal Power Sprayer Co., 420 South Mill St., Plymouth, Mich.

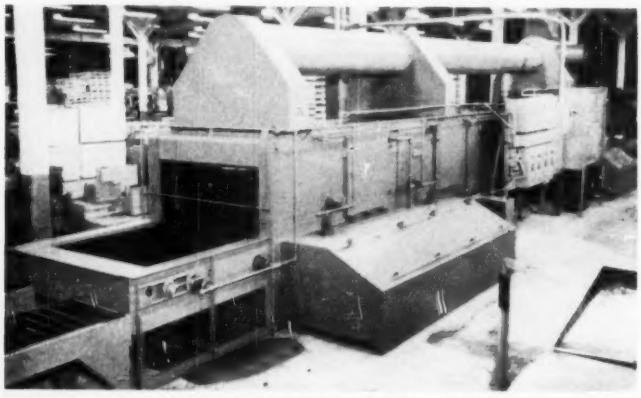


Bellows Dial-Feed Table For Up to 36 Stations

This 22-in.-dia table can be set to position 4, 6, 9, 12, 18 or 36 stations. The table will position quickly and loads up to 1000 lb. Air power eases the table into position where it is locked by an air cylinder.

The air motor used has a 3⅝-in. bore and a built-in Electroaire directional valve and speed controls. The valve is controlled by a 12-v solenoid control unit. Table top is easily removed for mounting jigs and fixtures, or oversized tables. The table is known as the Model BRET-22.

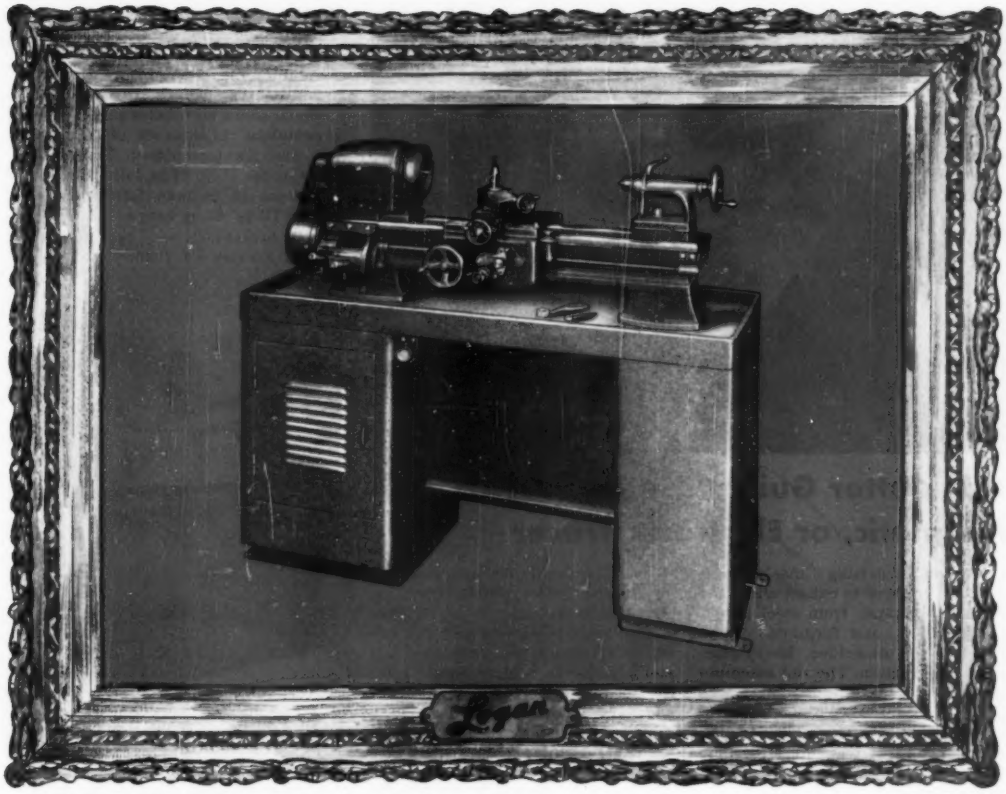
The Bellows Co., 230 W. Market St., Akron 9, Ohio



RUST-PROOFING MACHINE has a capacity of 500 sq ft of conveyor space per hr. It first sprays the work with a rust preventive, then a built-in, explosion-proof infrared oven dries it, and then the work is cooled to permit immediate handling. Safety features include an automatic CO_2 system and electric operating controls. The conveyor is kept continuously clean by a rotating brush and a detergent spray — *Industrial Washing Machine Corp., Rust-proofing Div., New Brunswick, N. J.*

Natural rubber added to an industrial floor material consisting of asphalt-rock limestone and cold-asphalt emulsion increases life span of the floor, reduces brittleness caused by cold, and increases traction. Resistance to loads, impact, and shock are claimed to be three times greater when rubber is added. Known as Immediate-Set, it is suitable for large-area floor resurfacing with a thin (½ in.) layer and for patching small areas.

Flash-Stone Co., Inc., 30 E. Rittenhouse St., Philadelphia 44, Pa.



Logan No. 955
Quick Change Gear Lathe
11" Swing, 1" Collet Capacity,
1⅜" Spindle Hole

PORTRAIT OF PRECISION

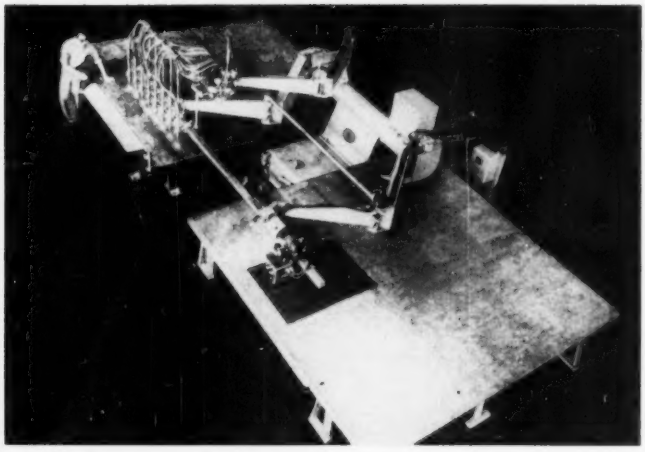
THE *Logan* LATHE
of Lasting Accuracy

The accuracy you get in a new Logan Lathe is still there years afterward. That fact has been proved on production lines, in machine shops and tool rooms, and is being re-established every day. The reasons for lasting Logan accuracy are to be found in advanced Logan design and rugged, precise construction. Because the Logan ball bearing mounted spindle, for example, needs no adjustment for any speed from 45 to 1500 rpm, original accuracy is preserved. The two V-ways and two flat ways of the Logan bed are precision ground to a tolerance of .0005", and are warp-free. Rugged overall construction insures smoothness for accurate work, and durability under hard daily use. With its 11" swing, 1" collet capacity and 1⅜" spindle hole, the Logan Lathe can handle a high percentage of any shop's metal turning. And remember, no other lathe of comparable specifications can match the Logan in economy.

WRITE FOR THE LOGAN LATHE AND SHAPER CATALOG

LOOK TO LOGAN FOR BETTER LATHES AND SHAPERS

LOGAN ENGINEERING CO.
4901 West Lawrence Avenue, Chicago 30, Illinois



Gas Cutter Guided by Manual, Magnetic, or Electronic Tracer

Pantograph cutting machine is guided by tracer to cut an unlimited variety of shapes from steel plates, slabs, billets, and forgings.

It has an all-welded, heavy-gage-steel construction. The rail assembly is made of specially rolled tracks with accurately machined surfaces to provide a smooth runway for the carriage. Other features are guide rollers on the carriage base and flame-hardened carriage wheels.

The Thym-O-Trol-controlled carriage drive motor provides stepless carriage speeds from 2 to 168 ipm. The carriage remote-control box can be mounted on the operating bar along with the remote controls for the gas-distribution system, and other auxiliary equipment to provide a complete operator's station. The cutter is called the No. 50 Travograph.

Air Reduction, 60 East 42nd St., New York 17, N. Y.

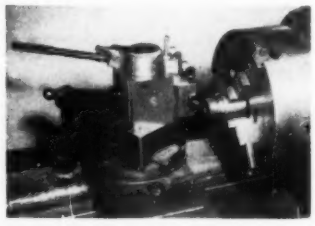
Low-Pressure Relief Valve Accurately Controls at 2 Lb

The A-120 relief valve features positive, accurate control at 2-psi air pressure and large volume exhaust at 3 psi. In addition, it has check-valve characteristics because it permits only one-way flow.

It is 1⅛ in. high and 7⅞ in. in dia. The working parts are mounted in a flexible rubber base and are protected by a steel cap and rubber shield. Components are fabricated from stainless steel and natural or solvent-resistant neoprene rubber.

The valve can be attached to either flexible or rigid surfaces. Attachment to flexible surfaces is accomplished by cementing the valve base to the unit it will control. For mechanical mounting, the valve is supplied with bolt holes in the base to the customer's specifications.

Andrews-Alderfer Processing Co., Inc., 131-9 Ash St., Akron 8, Ohio

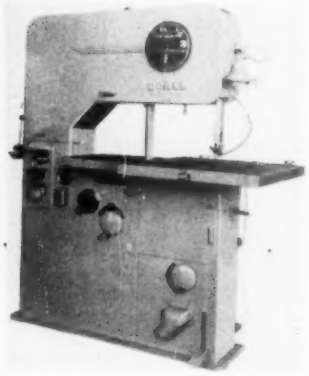


Marvic Universal Toolpost And Toolholders

This toolholder is claimed to be so rigid that when forced it will stop the lathe without injury to itself. The toolpost can be set at any desired angle. It is fastened by a lower locking pin which allows rapid adjustment to any desired position. Another advantage is that it is multiple faced—allowing four tool positions.

The toolholders are changed in one vertical motion, therefore the carriage of the lathe is only moved a limited distance. A vertical adjustment screw eliminates shimming. A complete set consists of a tool post and six toolholders. The size 3½ in. is for 11- to 14-in. lathe range; 4½ in. for 14- to 18-in. lathe range; 5½ for 17- to 28-in. range.

Lebo Industries, Inc., 31½ Fourth St., San Francisco 7, Calif.



Doall Contour-Sawing Machine

Contour sawing machine, known as the V-36-3, takes continuous saw, file, or abrasive bands up to ½ in. width. The three-speed transmission and drive provide variable tool velocity ranging from 25 to 6,000 fpm. Throth is 36 in.

Standard equipment includes: built-in blade welders with squaring shear, motorized grinder and thickness gage, assorted band tools and guides, automatic power feed, job-selector dials, speed indicator, dust spout, adjustable light, chip blower, and other features. It uses a 3-hp drive motor.

The Doall Co., Des Plaines, Ill.

Factory communication system has packaged plug-in components to facilitate repair and maintenance. Thus anyone can service the unit by plugging in numbered spare parts. Known as the Trolleyphone, it operates by feeding FM carrier current into the factory power system. Heart of the unit is the transreceiver containing the resistors and circuit. The set consists of shock-mounted transreceiver in a heavy case, loudspeaker, and press-to-talk microphone.

Farmers Engineering and Mfg. Co., Pittsburgh, Pa.

Hjalmar Ellstrom

INVENTOR OF THE GAGE BLOCK

The achievement of perfection . . . the mastery of any art, craft, or science . . . is a rare human accomplishment. A discovery or an invention that contributes to the total welfare of all mankind is rarely the heritage left by a single man. So rare is it, indeed, that in such infrequent instances, the true facts surrounding its origin are often distorted, or even lost in the conflicting claims of others who would seek the worldly gains to be derived from undeserved fame.

So it was with the Gage Block. For, actually, this basic standard of measurement used the world around was originally conceived and invented solely and entirely by . . . Hjalmar Ellstrom. Here, briefly, is the story of his accomplishment:

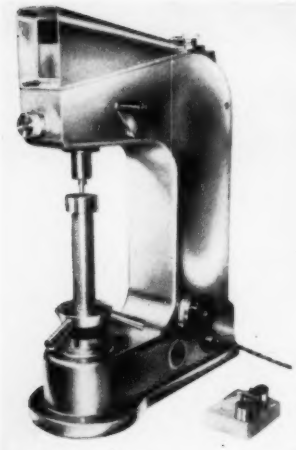
During the early 1890's, Hjalmar Ellstrom was employed by the government rifle factory at Eskilstuna, Sweden. He was a master craftsman . . . a man of infinite patience who took great pride in his work. He was a man of vision, too, who recognized the limitations imposed upon industry by the lack of sufficiently accurate measuring devices. So, with a then unheard of standard of precision as his ultimate goal, he alone developed and perfected his checking instruments and techniques . . . then alone he created the world's first gage block accurate to the infinitesimal millionth part of an inch.

Today, though his achievement has been copied and imitated by others, his personal unqualified devotion to accuracy is the exclusive heritage of Ellstrom . . . *now measuring in millionths for three generations.*

ELLSTROM STANDARDS DIVISION

DEARBORN GAGE CO. • 22035 BEECH ST. • DEARBORN, MICH.

Originators of Chromium Plated Gage Blocks



Italian Hardness Tester Provides Optical Readings

Especially designed for Rockwell and Brinell hardness tests, this optical instrument from Officine Galileo of Italy can also be adapted to special tests and Vickers measurements.

The tester gives hardness measurements following the Rockwell method, on any type metal in the Rockwell A through F scales by direct reading. Operation is simple and readings are easily taken. It makes use of a lever arm supported on knife edges and projects a magnified image of the reading on a screen. This optical balance maintains its calibration over extended time intervals and is said to be highly accurate.

Loads are interchanged automatically by a device which is controlled by an external knob. All loads are obtained by weights which insure absolute constancy of calibration. A built-in oil damper regulates the speed with which the load is applied. An external screw adjusts the speed.

Vickers measurements at 30 kg may be taken by using a pyramid diamond penetrator and a special microscope to read the diagonals of the Vickers impression.

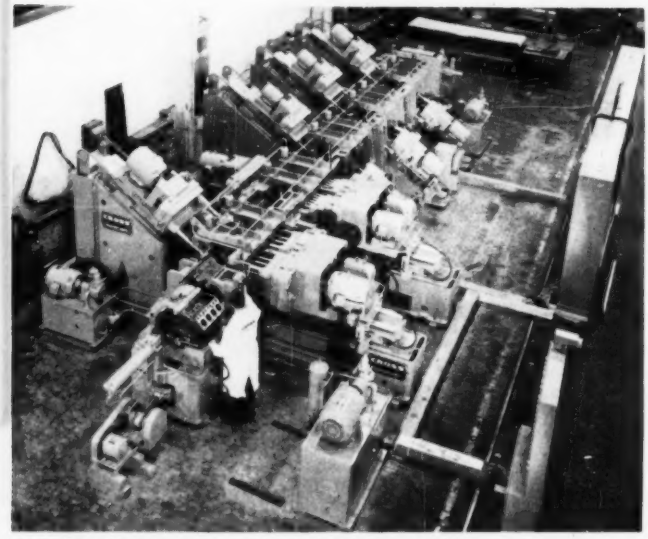
Standard equipment includes two test specimens, four anvils, and two steel ball penetrators. Imported by: *Metallurgical Instrument Co., 2454 W. 38th St., Chicago, Ill.*

Granite Surface and Angle Plates Have Hand-Lapped Finish

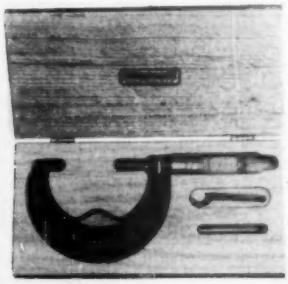
Illustrated is an 18x18-in. granite surface plate, attached to the squared edge of a 24x36-in. plate.

The surfaces are finished by hand lapping to an over-all tolerance of 0.00005 in. on each plate. The edge of the larger plate is lapped to 90° with the top surface, so that when the two are bolted together, every part of the projecting 18x13 in. is within 0.0002 in. of 90° with the plane of the larger plate.

Rahn Granite Surface Co., 641 N. Western Ave., Dayton 7, Ohio



TRANSFER MACHINE equipped with Toolometer performs 104 operations on V-8 crankcases with a production of 120 pieces per hr at 100% efficiency. Ten machine stations perform 56 drilling, 38 countersinking, 3 spot-facing and 4 reaming operations. There are also 2 gaging, 1 cleaning, 4 idle stations for tool changing, and 1 unloading and part-positioning stations. Chips are automatically conveyed to a central disposal point by an oscillating tray conveyor running through the center of the machine. Immediately following the station where two locating holes are finish reamed is the first gaging station. It is equipped with a 2-spindle air unit which measures the size of these holes and stops the machine if they are not within tolerance. At the other end of the machine, the final station is an inspection station where pins are pushed into each drilled hole to insure that they have the proper depths. If any one of these pins strikes an interference the machine is stopped and a warning light is illuminated. — *The Cross Company, Detroit, Michigan*



MICROMETER FOR MEASURING CRANKSHAFTS handles diameters from 1½ to 2½ in. The reading point is on the under side of the thimble, plainly visible while measuring. This feature is especially valuable for measuring between webs. It is furnished with a ratchet stop and lock nut and is available in metric scale. — *The L. S. Starrett Co., Athol, Mass.*

Look into this mirror for faster production

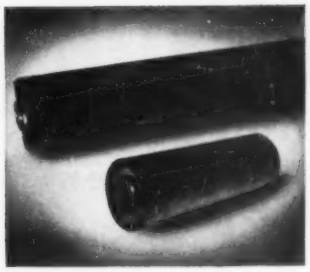
A brushing method used by a mirror manufacturer . . . or one similar to this . . . may help you improve product quality and cut rejects.

To provide a binder for the silvering compound, a base coat was formerly applied to the glass by hand. But uneven coating caused blemishes in the silver after drying. With the help of the **O**sborn **B**rushing **A**nalyst, a power brushing method with specially-engineered Osborn Heli-Master® Brushes was developed (1) to clean the glass thoroughly with water and (2) to *brush on* the base coat in a perfectly uniform film. Results: Blemishes in silvering practically eliminated. Mirror production has been stepped up and rejects cut to the bone.

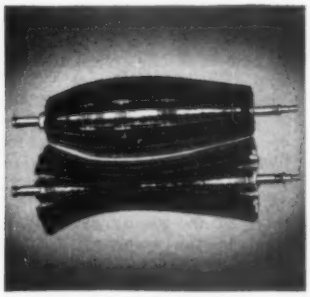
Look into the possibilities of power brushing for the improving of *your* manufacturing . . . whether it involves glass, metal, rubber, plastics or textiles. To get the help of an **OBA**, call or write *The Osborn Manufacturing Company, Dept. 578, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

OSBORN

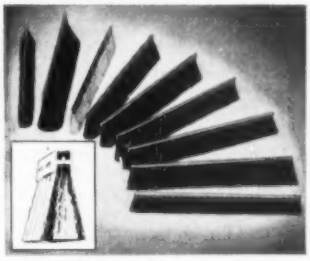
LOOK FOR THE NAME OSBORN . . . RECOGNIZED EVERYWHERE FOR QUALITY WORKMANSHIP AND MATERIALS



FOR HIGH SPEEDS. Osborn Heli-Master® "FA" Brushes provide a continuous, uniform density of fill up to a 180° brush face length. These can be built for many types of cleaning, scrubbing and finishing for smooth operation at speeds up to and exceeding 10,000 surface feet per minute. In wide range of fill materials for metallic and non-metallic materials.



FOR FLEXIBILITY. Osborn Rota-Master® Brushes may be used for wide-face applications such as glass washing, cleaning and unloading conveyor belts, wood staining, bus washing, rubber roughing, power sweepers. Open face design affords flexibility. Density is regulated by the number of Master strips employed.



FOR MANY JOBS . . . Osborn Master* Strip Brushes can be used in special mountings for a wide variety of power-driven applications—in straight strips or wound on an arbor as for the Heli-Master or Rota-Master Brushes. Have the **O**sborn **B**rushing **A**nalyst show you how these versatile brushes can help solve *your* problems.

*Trademark

Gage for Checking Bores In Limited Space

Nilco pistol-type bore gage was designed to check bores on the machine by the operator where space is limited and it is impractical to use a standard-length bore gage.

Features on this redesigned gage include the positioning of the indicators to the proper angle so that it will face the operator at all times and the adjusting of the handle to the proper checking depth. The length of the gaging depth is optional to the customer's requirements. Construction features include the three-point alignment; two-point gaging; and the one-piece construction centralizing plungers. The interchangeability of parts and simple construction is such that any gage can be maintained and repaired in the customer's plant.

Any size, type or make indicator can be adapted to the gage. They are made in five models and range from 1 to 12 in.

Nilsson Gage Co., Inc., Poughkeepsie, N. Y.

Tools for Blind Technicians

The Special Services Department of the American Foundation for the Blind offers a wide selection of devices to aid blind technicians, homeworkers, and craftsmen in their work. They have brought out a new catalog covering 186 items, of which twelve are listed for the first time.

One of the newest devices will help sightless electronic engineers and inspectors of whom there is an increasing number in the U. S. Called the Auditory Circuit Analyzer, it enables a blind person to take readings of resistances, voltages, and currents. A braille dial is turned until there is no sound in the earphones. It can be described as a sensitive, multi-range, bridge-type ohmmeter, a multi-range 20,000-ohm-per-volt sensitivity dc voltmeter and a multi-range dc milliammeter. It sells for $52.50.

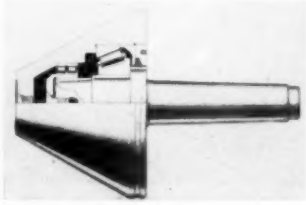
For the blind engineer there is a braille slide rule and a micrometer with raised graduations on the barrel, easily read to an accuracy of 0.0002 in.

Braille alarm clocks, and braille interval timers for use in developing film are also available.

Cloth-tape measures, stapled for in. and ft are popular items. For carpenters and handymen, there are brailled cast-aluminum rulers and a carpenters level which has a ⅞ in. chrome-steel ball which rolls freely in an angle welded to a V-edged bar. Also there is a saw-guide Miterite for cross-cutting and ripping.

A raised-line drawing kit, for blind teachers and students, enables them to feel drawn lines without turning over the page.

American Foundation for the Blind, Inc., 15 W. 16th St., New York 11, N. Y.



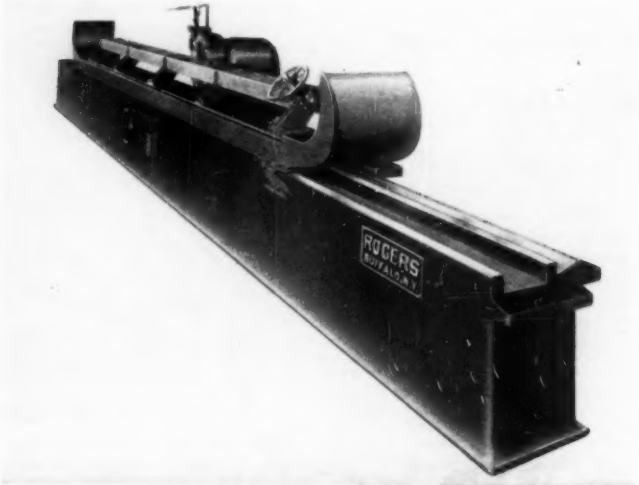
Bull-Nose Shank Center

Capacities up to 10 tons and head sizes of 24 in. are handled by this bull-nose center. It has two single-row anti-friction bearings that are shrunk on, spaced apart, and preloaded for maximum radial and thrust capacities.

The head is of hardened tool steel and the shank is heat-treated alloy steel. Lubrication is sealed in.

The center is made in Morse, Jarno, Brown & Sharpe, Hendy, or special tapers and straight shanks.

Ready Tool Co., 55½ Iranistan Ave., Bridgeport, Conn.



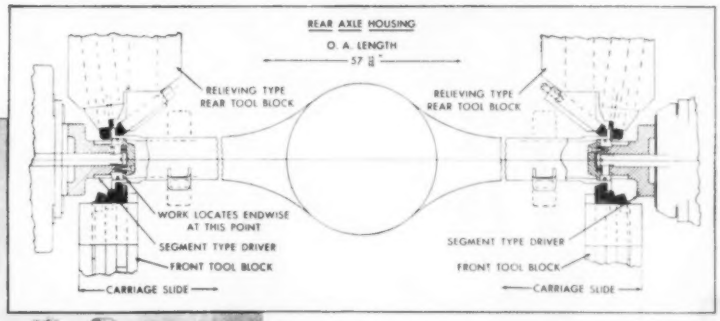
HUGE KNIFE GRINDER is for blades up to 210 in. in length. It can be adapted to grind flat faces and straight edges. The knives are lined up and supported on a 10-in.-wide slotted knife bar which is of the box swiveling type. A variable-speed motor drives the table at speeds of from 25 to 50 fpm. The grinding head is automatically fed by a heavy worm gear. Cut is adjustable for increments of from 0.0002 to 0.006 ipr. It can be hand fed from the front or rear of the machine. — *Samuel C. Rogers & Co., 183-201 Dutton Ave., Buffalo 11, N. Y.*

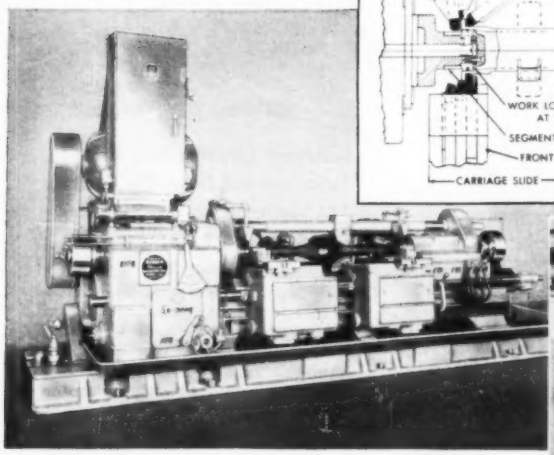
Wallex is an oxyacetylene hard-facing rod for abrasion resistance with good impact- and corrosion-resisting properties. Its composition is chromium, molybdenum, manganese, silicon, carbon and iron. They are said to possess excellent weldability and are available in 3/16-, 1/4-, and 5/16-dia rods 8 to 12 in. long. Hardness of the rod is rated at 57 to 61 Rc. Melting point is approximately 2375 F.

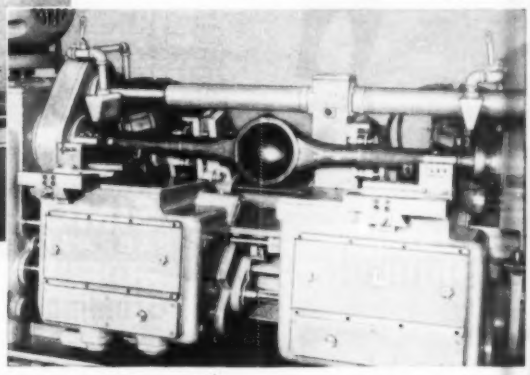
Wall Colmonoy Corp, 19445 John R St., Detroit 3, Mich.

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. **"THE Lo-swing PEOPLE"** SENECA FALLS, NEW YORK







MODEL "AR" Lo-swing WITH DOUBLE END DRIVE CUTS MACHINING COSTS ON REAR AXLE HOUSING

Problem: To turn and face both ends of Rear Axle Housing simultaneously.

Solution: The Model AR Automatic Lo-swing Lathe selected for this job was equipped with a Double End Drive to secure a balanced, efficient drive and prevent torsional deflection of the Axle Housings while under cut.

The right-hand Head of the Double End Drive Mechanism is a massive, two-piece unit securely clamped to the ways of the bed. Its top part slides on large bearing surfaces and is pneumatically-operated to facilitate loading and unloading of the work. The large diameter drive shaft for this head is splined to permit free longitudinal movement of the sliding member, and is supported with a central bearing.

The close-up view above shows details of the tooling and also the two spring-loaded vibration dampeners which prevent vibration of the out-of-balance part when revolved at high speed. This view also shows the two front carriages; the left-hand carriage feeds towards the headstock while the right-hand carriage feeds towards the tailstock. The mechanism for reversing the feed on the right-hand carriage is enclosed in the housing shown on the extreme right-hand end of the bed in the overall view above.

The axle housing is driven with two pneumatically-operated expanding segments...the air operating cylinders being mounted directly on the right and left hand Driving Head Spindles. Details of the tooling are shown in line drawing.

The operating cycle consists of loading the Axle Housing in two cradles, after which the sliding member of the right hand head advances and locates the housing endwise in relation to the driving chucks. This first movement is controlled by a four-way air valve at the right hand end of the machine. The second movement of this valve closes the two driving chucks. The machine is then started with the main clutch control lever located on the right side of the right-hand carriage, which is the normal operating position.

The automatic machining cycle then takes place and the machine stops automatically at the end of the cycle, ready for unloading and reloading. Consult Seneca Falls Engineering Staff on your turning problems.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

PRODUCTION COSTS ARE LOWER WITH Lo-swing

Pretty smooth grinding these days, Jim!

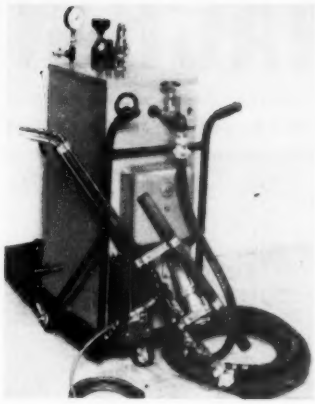
SIMONDS ABRASIVE CO.

Grinding Wheels

It's inspection OK's instead of KO's since Simonds Abrasive Company wheels were put to work in the grinding room. Why? Because Simonds wheels are accurately specified to give top results on the jobs they have to do. They're part of a complete line containing everything to smooth your way to real production efficiency . . . grinding wheels, mounted wheels and points, segments and abrasive grain . . . all made under complete quality control by Simonds Abrasive Company, a major manufacturer of grinding wheels for almost 60 years. Write for data book and name of your distributor.

SIMONDS ABRASIVE CO., PHILADELPHIA 37, PA. BRANCH WAREHOUSES: CHICAGO, DETROIT, BOSTON
DISTRIBUTORS IN PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.



Detergent Cleaning Unit Uses Twin Jets and Finger-Tip Control

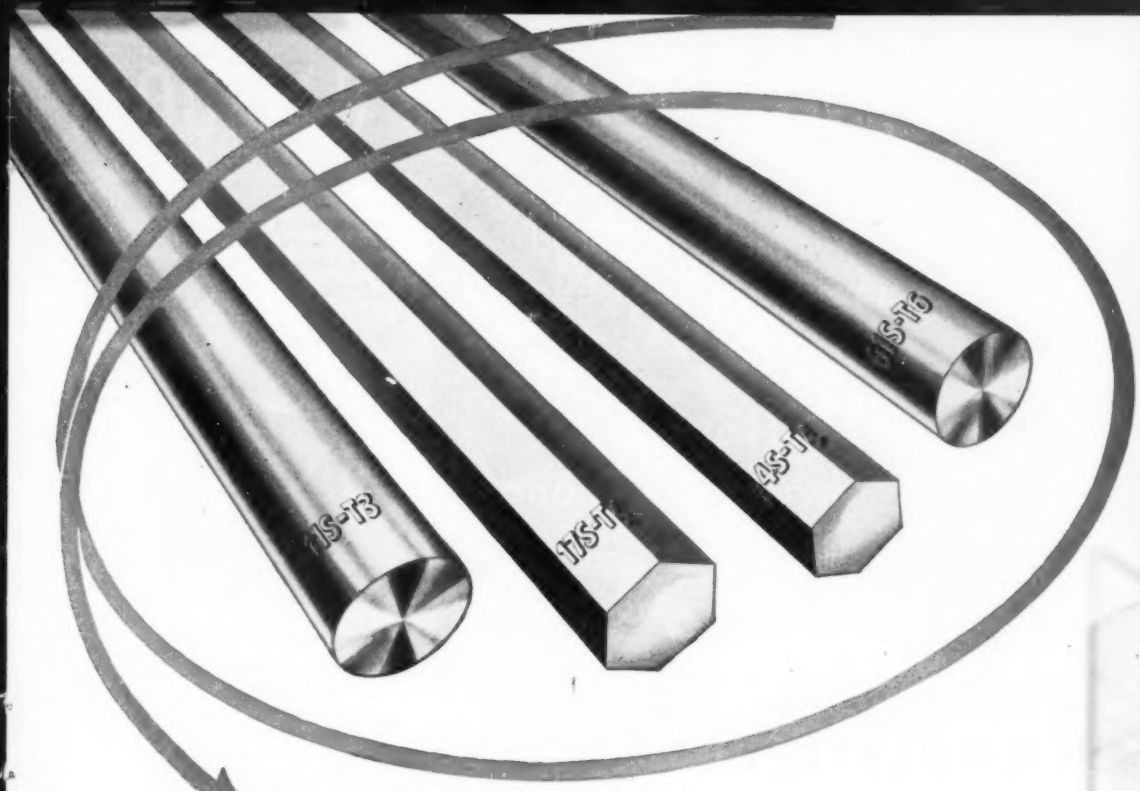
The Speedyelectric Steam-Jet Cleaner, Model JC-25, is built to operate at pressures up to 200 psi, which is higher than what was previously considered the best pressure, normally 125 to 145 psi. A twin-jet steam lance with finger-tip control, together with the combination of high pressure and super velocity, is said to give the unit a powerful cleaning action.

Only 16 in. wide and 48 in. long, the unit is designed for maximum portability in close quarters. It is self-contained with space provided on the all-steel truck to mount a water tank of sufficient capacity for three to four hours of continuous operation. Small quantities of solvents are used effectively and economically as they are not diluted by mixing with gallons of water at the jet. Dirt, grease, oil, and caked-on accumulations melt away before the powerful jet of hot dry steam and solvents applied instantly as needed under finger-tip control of the operator. There is no flooding of the working area, no smoke, flames or fire hazard.

It is rated at 20 kw, and under ordinary operating conditions consumes 15 kw per hr.

Livingston Engineering Co., Worcester, Mass.

The Adjust-A-Leg Equalizing Sling, consists of an equalizing unit and a wire rope sling. The unit is placed on a crane hook and the operator moves the crane to the approximate center of gravity. The riggers hook the sling legs to the load. As the crane lifts, the legs—turning on a sheave—adjust themselves to the proper lengths. As the load lifts the



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KNOWING THESE ALLOYS WILL HELP YOU DO A BETTER JOB

Aluminum alloys are different . . . vary widely in machinability, workability, and strength. Selection of the right one and machining it correctly means fewer rejects and greater efficiency.

ALCOA 11S-T3 — The best general-purpose aluminum alloy for automatic screw machines.

ALCOA 17S-T4 — Stronger than 11S-T3 . . . best for deep-hole drilling.

ALCOA 24S-T4 — Stronger than 17S-T4 . . . widely used for aircraft and other high-strength applications.

ALCOA 61S-T6 — Has high corrosion resistance . . . especially suited to finishing by Alumilite* process.

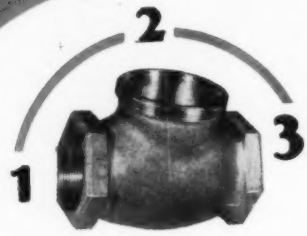
KNOWING THESE TECHNIQUES MAKES MACHINING EASY

To help you, Alcoa has prepared a 95-page booklet "Alcoa Aluminum in Automatic Screw Machines", based on more than 63 years of experience. It contains everything you need to know about tool design, setup and operating technique. Get your free copy by writing: ALUMINUM COMPANY OF AMERICA, 871M Gulf Bldg., Pittsburgh 19, Pa.

*Patented

ALCOA

ALUMINUM SCREW MACHINE STOCK



More Pieces
COMPLETELY
finished in less time on
GOSS & DeLEEUW AUTOMATIC CHUCKERS

This machine . . . already acknowledged and accepted as a metal-working achievement, and the only standard one of its kind . . . winds up a day's operation with all parts assigned to it completely finished and with no secondary operations necessary. When fully loaded, a complete piece is finished at each index cycle. High productivity is attained with simple tooling.

The "1-2-3" exclusive Goss & De Leeuw feature provides for finish machining three ends of a part simultaneously or in sequence. All operations are performed in a single set-up, and complete finishing done in much shorter time than by conventional methods.

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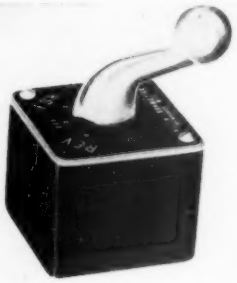
Send for illustrated literaure which fully describes this recent Goss & De Leeuw development in chuckers. Submit samples of your work for time and cost estimates.

GOSS *and* DE LEEUW
MACHINE COMPANY, *KENSINGTON, CONN., U.S.A*

weight locks the legs in place and the load is carried level. Two-thirds of the rated load may be imposed on one leg without slippage. It is made in eight sizes ranging from ¾ up to 15 ton. For 30-ton loads, two 15-ton slings may be used. The manufacturer claims a five-to-one safety factor at 45° angle.

Caldwell Co., Rockford, Ill.

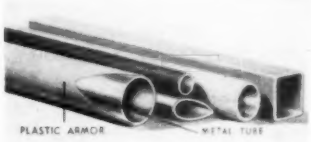


Reversing Drum Switch Has Eight Contacts

The Bulletin-350 Style-A switch is the equivalent of a three-pole, double-throw switch. It is for machines and equipment requiring across-the-line starting and reversing switch for ac and dc motors rated at 2 hp and less.

Housing of the unit is bakelite containing eight fixed contacts, a moving contact assembly, handle-coverplate assembly, and mounting screws. Contacts are cadmium-silver alloy—eliminating maintenance. Extra flexibility in mounting is provided.

Allen-Bradley Co., Milwaukee, Wis.



Plastic-Armored Metal Tubing For Industrial Applications

Made in a large variety of sizes, colors and finishes, the Dekoron tubing can be used in many industrial and consumer applications. The patented extrusion process for coating the tubing permits application of vinyl or polyethylene plastic over seamless tubing or tubing with welded, lap or butt seams. It can be applied over any kind of metal core.

The tubing, according to the manu-

TROUBLED BY CLOSE TOLERANCES IN HOLE PRODUCTION?

You Can Stay Within Limits and Get Speed, too, With

SUNNEN HONING

Quickly removes heat treat distortion.

•

Vacuum pump body
Material = Malleable cast iron
Hole diameter = 1⅜"
Length = 1.0"
Interruptions = ¼" keyway
Tolerance = ± .0001"
Finish = 3 micro-inches
Stock removal = .002"
Production = 25 per hour (including gaging)

•

Holds true accuracy throughout length of part

•

Perfect alignment speeds assembly, improves operation.

Sunnen honing machines hone metals, ceramics, glass—are used for everything from de-burring to micro-fitting. Dimensional accuracy is guaranteed to .0001", and in some cases is being held as close as 25 millionths. Bores are geometrically true, free from bell-mouth and taper. Surface finish to 2 micro-inches RMS can be produced in hardened steel. Diameter range is ⅛" to 5½".

A complete installation costs about $1,000—and usually pays for itself in a few months' time. Investigate Sunnen Honing for *your* plant; it may be just what you need for hole sizing and finishing. Mail the coupon for details.

Sunnen Honing produces accurate holes—reclaims expensive rejects from other operations—frequently solves I.D. sizing and finishing problems *when nothing else will.* Latest model machines have many improvements that cut honing time and reduce gaging time. Jigs, fixtures, and set-up time are practically eliminated. Even relatively unskilled help can hone parts at rates up to 400 per hour, *with controlled duplication of size.*

SUNNEN PRODUCTS COMPANY
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Canadian Factory: Chatham, Ontario

SUNNEN HONING

SP 588-R

SUNNEN PRODUCTS COMPANY
7927 Manchester Ave., St. Louis 17, Mo.

☐ Please send complete information on Sunnen Honing.
☐ Have a honing engineer call.

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Company .....

Address .....

City ..... State .....

HERE'S THE DoALL WAY
to easier, more accurate filing:

Guide the Work Instead of the File
—Cut all of the Time

Top: Internal filing easily done on thick, thin or irregular shapes.

Bottom: Remove flash, irregularities from castings, forgings, etc., quicker at less cost.

GET DoALL FILE BANDS
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DoALL precision file bands are available for immediate delivery—Get the right type for every job. For cutting aluminum, brass, cast iron, copper, zinc, steel and non-ferrous metals DoALL file bands come in flat, oval and half round sizes of ¼", ⅜", ½".

Check these DoALL Precision Band Filing Features that handle all External and Internal Filing Jobs

1. **4 times faster than jig filing. 9 times faster than hand filing.**
2. **Easy to operate. Handwheel control of variable speed means more efficient chip removal and longer file life.**
3. **No lost motion. Not a reciprocal, DoALL continuous filing cuts all of the time.**
4. **Up to 50% more cutting efficiency.**
5. **Cuts file costs, unit costs, gives more production.**
6. **Job Selector on the machine gives correct operating speed for filing a wide range of materials.**

YOU don't need years of experience to acquire that "touch" of the expert hand filer. Just feed the work into the DoALL Band Filer and quickly get a smoother, more accurate finish. DoALL continuous band filing really bites off the metal in uniform quantities—lets you maintain precision of cut for both external and internal filing jobs. For tool and die shops, foundries, material fabricators or what are you, DoALL band filing is your answer to better, faster work at minimum cost. Ask for a FREE DEMONSTRATION in your own plant. Call your local DoALL store or write:

THE DoALL COMPANY, 254 N. Laurel Ave., Des Plaines, Ill.

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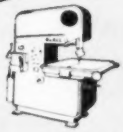
Learn more on how DoALL band filing can do every filing job better, faster and at lower cost.

BM-10

INDUSTRY'S NEW TOOLS

DoALL

33 SALES-SERVICE STORES

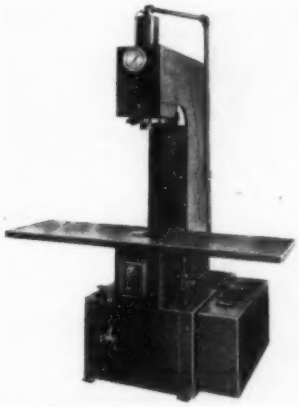


Machine Tools . . . Gaging Equipment . . . Tool Steel . . . Band Tools . . . Metal Working Supplies

facturers, will not crack, chip, peel or flake. It resists corrosion from salt air, moisture, oils, acids and alkalies, and is unaffected by normal temperature changes. It is warm to touch, free from static electric shock, and can be given any desired dielectric properties.

Formerly, the tubing was available only in a standard line of round stock but is now available in square, triangular, oval and streamlined shapes.

Samuel Moore & Co., Dekoron Tubing Div., Manta, Ohio



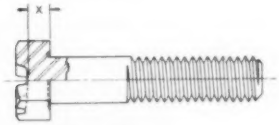
M & N Hydraulic Press with Power Ram Return

C-frame hydraulic press does such work as pressing bushings, broaching, forming, punching, staking, and other applications.

It has an extended, heavy table to permit handling large, bulky work. An even heavier table with V-blocks is available to make a shaft-straightening press.

Capacities are 10, 20, 30, and 40 tons.

M & N Machine Tool Works, 287-293 Allwood Rd., Clifton, N. J.



Self-Locking Bolts Guard Against Vibration

Slotted-type place bolts require no nuts, washers, or other devices to lock against vibration when drawn up against a rigid seat.

Cold-headed place bolts are fully reusable, one-piece and all-metal, and can be made of carbon as well

We know that those of you who use Ettco-Emrick Tapping Attachments will close your books on a full year of profitable, trouble-free tapping. Now, we'd like to wish all our old friends—and new friends—another happy and prosperous new year.

If fast, accurate tapping with minimum tap breakage and work spoilage contributes in any way to the success of *your* new year—we at Ettco will feel our wish has been granted.

Ettco-Emrick ...for drilling and tapping equipment at it's best!

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HOW TOOL CRIB CONTROL WILL CUT *YOUR* TOOL COSTS, TOO

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This new Booklet tells how 20 plants stopped loss and theft of tools, reduced crib inventories, cut idle waiting time of men and machines with McCaskey Tool Crib Control . . . how tool breakage was reduced and disputes were stopped . . . all accomplished at a surprisingly small cost.

Savings and service improvements add up to substantially lower tool expense and greatly improved operating efficiency.

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as alloy steel. They are available in a range of American Standard sizes from ¼ to 1 in., in coarse- or fine-thread pitches.

The bolt's spring-action head not only establishes the locking action, but also insures against fatigue, impact, or shock failure. Upset slots across top of head divide it into six equal segments. Upset operation also forms a narrow circular recess under the head and next to the shank. As the bolt is drawn up, the upward pressure on the bearing area slightly displaces the segments on top of the head, to effect the diaphragm spring action.

Grain flow is continuous through shank and head segments for maximum strength, and the shear section of the head is stronger than the mean equivalent area of the thread. The bolt, as a result, is always capable of carrying a load equivalent to that of a conventional bolt or cap screw.

The National Screw & Mfg. Co., 2440 E. 75th St., Cleveland 4, Ohio

JackStacker for Operation In Minimum Aisle Space

The 1000-lb.-capacity counterbalanced JackStacker incorporates many features which provide maximum efficiency in handling loads in a minimum of aisle space.

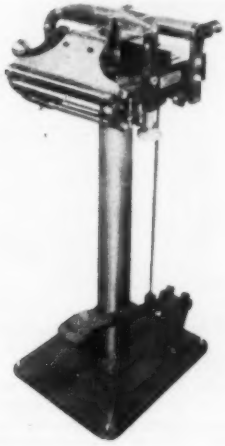
The "walkie" electric truck is designed for both horizontal and vertical movement of 1000-lb loads up to 48 in. long. It features telescopic design in the following standard models:

59-in. collapsed height provides 82-in. fork elevation. 71-in. collapsed height provides 10-in. fork eleva-

tion. 83-in. collapsed height provides 130-in. fork elevation.

This truck is only 46½-in. over-all length with the forks rotated into a special carrying position. All operating controls are located in the handle head within the immediate reach of the truck operator. The operator can conveniently lift and tilt his load while maneuvering the truck into position. The brakes have been designed so that braking action is independent of the position of the control handle. This greatly reduces aisle-space requirements and is an important safety feature.

Lewis-Shepard Products, Inc., 193 Walnut St., Watertown, Mass.



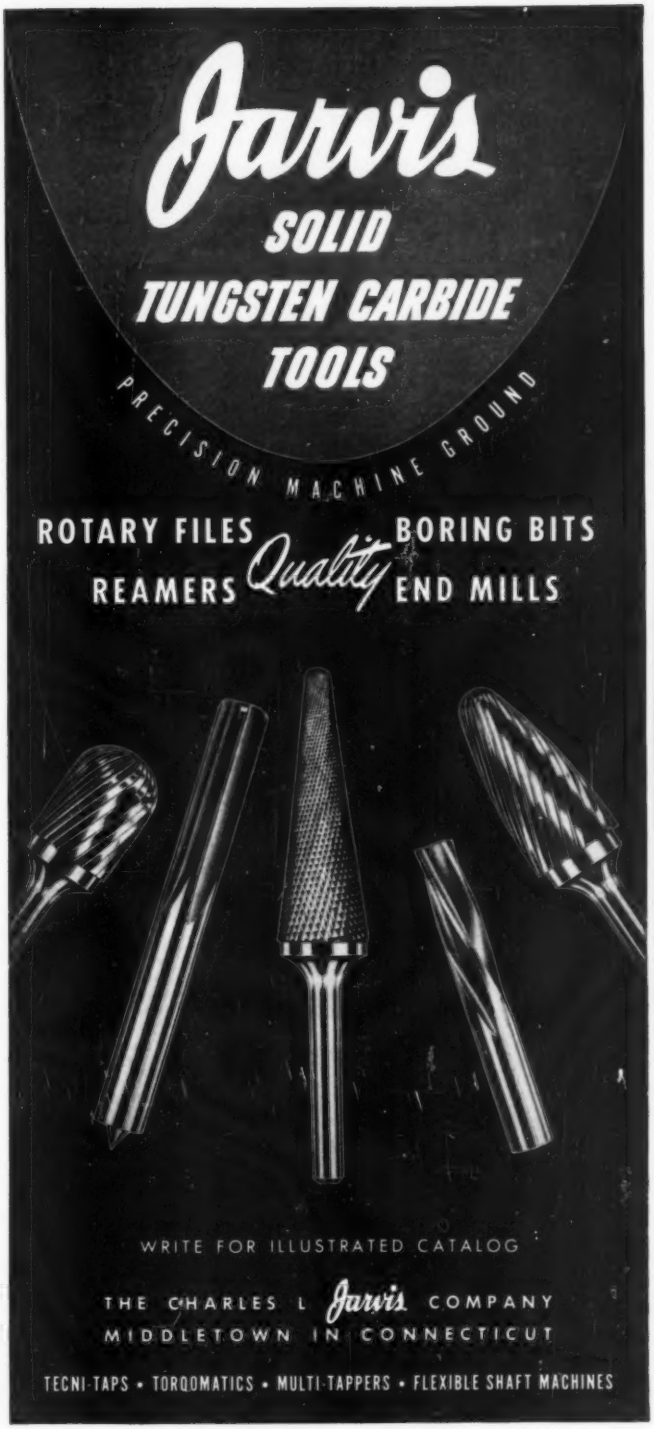
Metal-Forming Machine Can Make Complete Folds

An improved model Bendit metal-forming machine now has a capacity to bend 15 in. of 18-gage mild steel or equivalent. This machine forms sheet, strip, and rod stock and small tubing into innumerable complex as well as simple shapes.

It will form any desired radius from 1/32 to 5/8 in., and will make boxes up to 15x15x5 jn., handles low ductile materials, also plated or painted metals without fracture or injury to the surface when the radius of bend is large enough to avoid cracking the paint. Bends of any angle, including complete folds, and partial bends can be made.

The machine was primarily developed for short-run production work, such as forming aircraft components. It eliminates the need for expensive dies and intricate tooling; is provided for positive stops and gages for duplication, and is open-ended front and back for feeding long strip stock.

Interchangeable bending blades



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GUSHER
MACHINE TOOL
COOLANT PUMPS

With production stepped up to take care of civilian and defense demands the performance of every part of your metal cutting machinery is important.

When you specify Ruthman Gusher Pumps you are sure. For Gusher Pumps have proved that they give dependable service.

There is no packing nor priming needed. All rotating parts are electronically balanced to cut vibration to a minimum. With no metal-to-metal contact within the impeller housing this friction is eliminated. Ruthman Pumps are built to give you long trouble-free service.

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Why Operators PREFER...

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OPEN BACK
INCLINABLE
POWER
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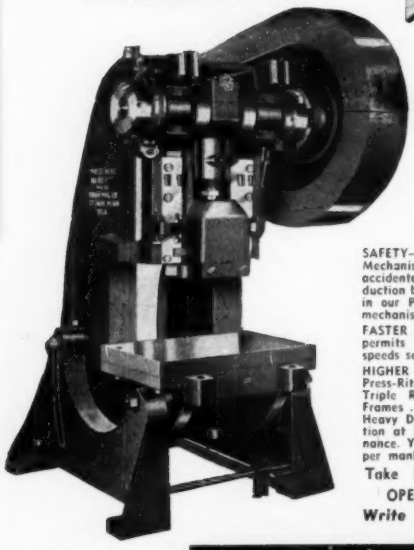


. . . For safety, faster set-ups, higher output, Press-Rite Power presses are first choice with every operator who has used one. Operators back up their preference with facts:

SAFETY—Press-Rites' Non-Repeat Single Stroke Mechanism helps to eliminate possibility of accidental injuries which means greater production because operators have more confidence in our Press-Rite cam actuated single stroke mechanism.

FASTER SET-UPS—The Extra Large Die Space permits easier handling of bulky dies . . . speeds set-ups . . . less down time.

HIGHER OUTPUT—Added features such as the Press-Rite Airflex Air Friction Clutch . . . Triple Ramway Lubrication . . . Uni-Cast Frames . . . Anti-Friction Roller Bearings . . . Heavy Duty Construction . . . permits operation at higher speeds with minimum maintenance. You gain more output of perfect pieces per manhour.

Take IT FROM YOUR OWN PRESS OPERATORS — Specify Press-Rites.

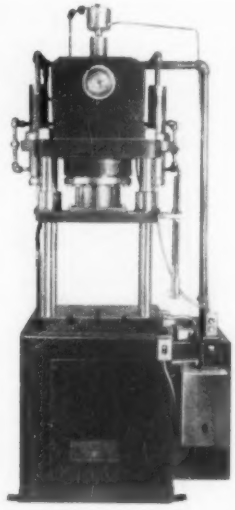
Write for full information, TODAY!

7 Models
5 to 85 Tons
Capacity

Sales Service Machine Tool Co.
2355 UNIVERSITY AVENUE
ST. PAUL 4, MINNESOTA

of soft steel are supplied, to be cut or sawed to size to meet job requirements. The actual bending is done by a hardened and ground steel roller.

Kilham Engineering, Inc., Plainville, Mass.



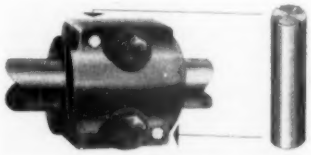
Rapid Approach on Hydraulic Press With Single Power Pump

A single power pump is used on this press to obtain rapid approach to the work with slow pressing speeds at full load. It is thus possible to use a motor considerably smaller than on conventional double-pump systems.

Features that show the presses versatility: The platen can be returned by either pressure or stroke setting; it can be made to reciprocate automatically or single cycle.

It is built on special order only and is available in 25-, 50-, 75-, and 100-ton capacities.

M & N Machine Tool Works, 287-293 Allwood Rd., Clifton, N. J.



Grooved Pins Provide Accurate Alignment Between Components

Lok Dowels—a precision grooved pin is said to provide a simplified method of establishing and retaining accurate alignment between compo-

CP-3440 AIR IMPACT WRENCH

saving 60% of nut-running time

The packing nuts of this condenser are being run to uniform tightness because of the power regulator of the CP-3440 REVERSIBLE AIR IMPACT WRENCH. This control of tightness also adapts the CP-3440 for assembly line work anywhere.

On this particular job the CP-3440 is saving approximately 60% of the time required when a T hand wrench was used — and operator fatigue is eliminated.

Less than six inches long, the CP-3440 works where longer tools cannot be used, and weighs but 4½ pounds.

The complete line of CP AIR IMPACT WRENCHES meets every demand for tightening or removing nuts and bolts, driving and removing wood and lag screws, driving and removing studs, and for tapping, in all kinds of maintenance work. *Write for Bulletin 812.*

CHICAGO PNEUMATIC TOOL COMPANY

General Offices: 8 East 44th Street, New York 17, N. Y.

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SUPREME Brand CHUCKS feature dependable one-piece construction

The one-piece construction of Supreme Brand Chucks assures the positive, dependable grip desired by those workmen who appreciate precision tools. Sturdy and rugged Supreme Brand Chucks stand up under the hardest working conditions. They are accurate . . . they are a quality product.

When you buy tools equipped with Supreme Brand Chucks, you can depend upon them.

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SUPREME BRAND CHUCKS

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THE CHUCK THAT LIVES UP TO ITS NAME...SUPREME

nent parts of any mechanical device, machine components, dies, jigs, and fixtures.

They are made of cold drawn steel, centerless ground and polished. Four parallel grooves impressed along half the length of the Lok Dowel displace a carefully determined amount of metal to each side of the groove. No chip is removed. When the dowel is forced into a hole, the crests of the eight flutes are substantially forced back into the grooves, but the resiliency of the metal sets up outward radial forces that securely lock the grooved portion of the dowel in place.

They are immune to shock and vibration and will not slip or drop out under the hardest blows or continuous vibration. Disassembly and reassembly of any part is faster and easier because the grooved portion stays in place while the ungrooved end of the pin is easily slipped out of its part.

Installation is quick and simple. The mating parts are clamped or fastened in the desired position, a slightly under size hole is drilled to proper depth, reamed to precise size and the dowel is pressed or driven into place.

They are available in standard steel or can be made to order from drill rod or stainless steel.

Driv-Lok Pin Co., Sycamore, Ill.

Swedish Vise Holds Irregular Objects

A universal screw vise that instantly clamps round, tapered or irregular objects is now available through the distributor in the United States. Called the "Sevo" vise, its jaws consist of a series of machined and ground flat plates which hinge or swivel in any desired direction to coordinate with the shape of the held object. These jaws are so designed

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At current steel production rates, 50% MORE SCRAP is needed than in the peak year of World War II. The shortage is so real that steel company representatives are calling on every company in the country to find ways of relieving the situation.

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2. Call in your dealer—sell your scrap—*NOW!*

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Screw Machine Foreman emphasizes advantages of

LIPE *Automatic Magazine Loading*

BAR FEED

In a recent letter to Mr. H. L. Burlingame, Screw Machine Foreman at Friden Calculating Machine Co., Inc., San Leandro, Calif., we asked how much had his new Lipe Bar Feed increased production on a B&S #00G. This was his reply:

"To be perfectly frank, when we first installed your air feed attachment, it was not with the idea of increasing production but to find some way to handle polished needle bars in order to hold length and eliminate feed finger scratches.

Feed Finger Savings Pay For Bar Feed

"In checking our records on parts #80011 and #80011-T (above), we find that originally using feed fingers, we produced approximately 300 pieces an hour. Upon the introduction of your Automatic Magazine Feed, we have stepped this up to approximately 500 pieces an hour.

"However, I cannot stress too strongly that the big advantage to us is being able to feed polished needle bar and obtain close limits on overall lengths." With feed fingers of brass, bronze, cast-iron or other material, wear and slippage still persisted, Mr. Burlingame's experiments revealed. He concludes:

"The saving to us on feed fingers alone has more than paid for the attachment we have installed."

Lipe Automatic Magazine Loading Bar Feed will . . .

- Feed automatically to the smallest remnant.
- Accurately feed any required distance.
- Handle exact-size polished stock without marring or scratching.
- Reduce scrap loss.
- Eliminates feed finger replacements and repairs.

Write today for further information.

Lipe-ROLLWAY CORPORATION
Manufacturers of Automotive Clutches and Machine Tools
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that they can be moved in relation to each other and the workpiece can rest on a contact surface underneath. By turning the main screw the locking jaws position themselves and can then be locked to retain their directional position.

Unlike conventional vises, the tightening screw requires only a slight turn without imposing a heavy torque to tightly grip the object. When filing, drilling or shaping objects, the worker can save much time by the quick and universal action of the vise.

The vise jaws are made of precision ground Swedish steel. The distance between jaws is 2½ and 5 in,. in two sizes.

De Wilde-Jones, Inc., San Francisco, Calif.

Magnesium Safety Tongs Speed Press Feeding

These tongs have a tapered nose to facilitate handling of small stock. Made from specially alloyed magnesium, they are designed to crush if accidently caught in the die opening. Although weighing only 2½ oz, the tongs give positive rigidity and long service life.

Magline, Inc., Pinconning, Mich.

Corn cob is ground, cleaned, and milled and used as an abrasive polisher, burnisher, absorbant, filler, etc. It is used in air blasting to remove carbon, greases, paint, dirt etc. Characteristics: dust-free, durable, 32% fibrous, uniform classification and controlled density of particles. Known as Cocob, it is ground to 10, 20, 40, and 60 mesh, and to specification. It is claimed to absorb 3.75% of its own weight.

Agri-Indus Mfg. Co., 1327 Huntington Bank Bldg., Columbus 15, Ohio

Combined tool suspension and air-supply hose reel is a compact, completely packaged unit easily installed over the work bench and on production assembly lines. The pneumatic screw driver or other tool is suspended on the hose which supplies the air requiring no cable suspension with separate air hose, such as is customarily used. The weight of the tool is counterbalanced by the

spring tension of the reel. It permits the operator to direct his full efforts to the work. Releasing tool lifts it automatically to a predetermined convenient position directly over the work spot. Automatic uptake of tool leaves both hands free to remove work from machine. The unit can be equipped with 15-ft of ¼-in. ID hose with male-fitting standard. A rubber bumper stop is provided to control length of travel when tool is released. Universal mounting brackets permit mounting on post, wall, or hanging cable.

Wayne Pump Co., Fort Wayne 4, Ind.

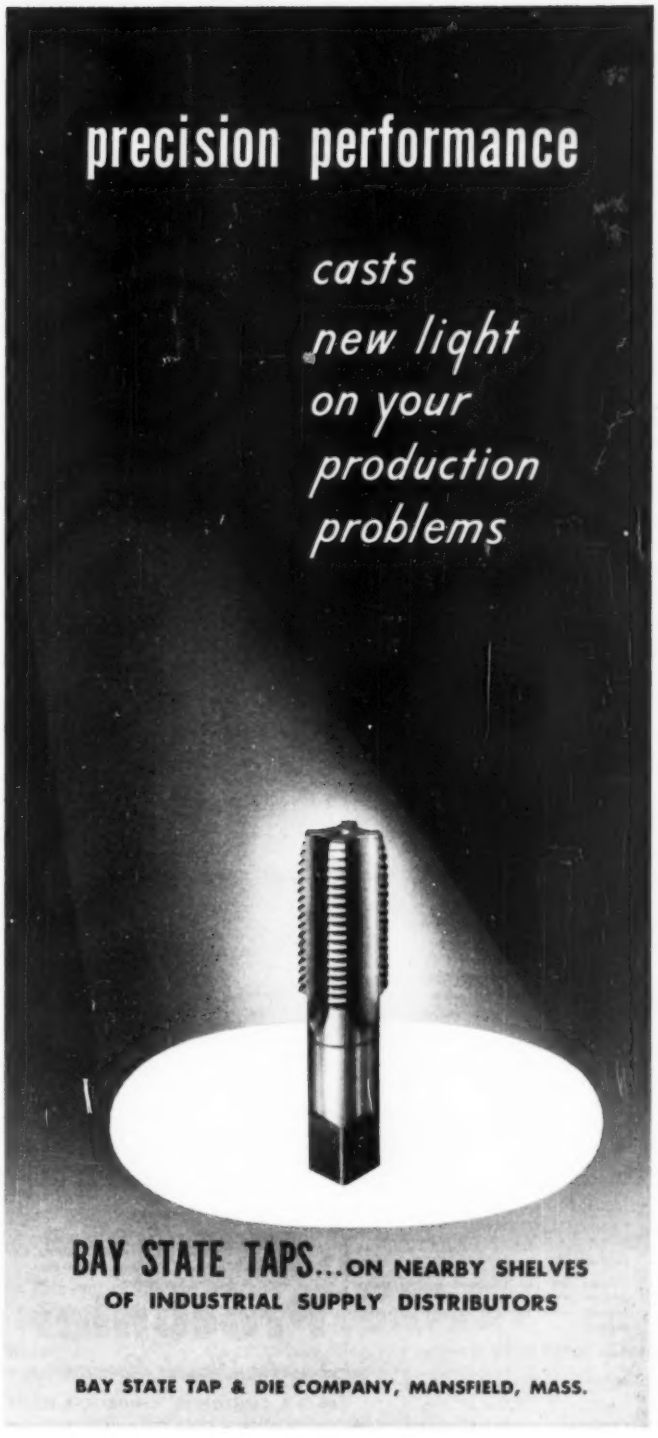
Ospho, a carefully balanced formula of Orthophosphoric (H_3PO_4) and Dichromate ($Na_2Cr_2O_7$) with extenders and wetting agents, is being successfully used to prime rusted surfaces. It is said that all that needs to be done is to remove loose rust and scale with a wire brush and apply a coat of Ospho, let dry, and paint. Ospho is a metal primer, not a paint. When Ospho is applied to rust it causes the iron oxide to chemically change to iron phosphate, an inert, hard, dark gray substance. Rust action is stopped and the subsequent paint attaches itself so tightly that moisture and oxygen cannot attack the metal. It is equally effective for exterior and interior work alike. It requires no mixing or stirring and is said to be easy to use.

Rusticide Products Co., 3125 Perkins Ave., Cleveland 14, Ohio

EutecTrode 26 for cast-iron welding, is reported to differ from conventional ferrous electrodes in that for the first time the carbon content of the deposited metal is evenly distributed. Analysis of the metal deposited will show a uniform amount of carbon so that the deposited metal is similar to a high tensile, high carbon steel, thereby increasing the tensile strength of the weld.

Eutectic Welding Alloys Corp., Dept "P," 172nd St. & Northern Blvd., Flushing, L. I., N. Y.

A spur-gear hoist, the Challenger, is now available in half and one-ton capacities. The entire unit, including standard length of high-strength coil chan for an 8-ft. lift, weighs only 39½ lb, and is easily moved from one place to another, as needed. Strength and unusual resistance to shock-load breakage are said to be gained by the use of formed steel plate in the housing in place of the more common cast-aluminum alloy. The back plate is laminated



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5. PLUS many other exclusive features.

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—to give extra rigidity for supporting the hoist mechanism. The hoist can be disassembled in a matter of minutes with simple tools.

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The Boyer-Campbell Co., 6540 St. Antoine St., Detroit 2, Mich.

Electric drills have die-cast aluminum housing trigger switch with safety locking device, sealed ball bearings, three-jaw geared chuck, and chuck guard to protect worker's hands. They operate on any standard voltage, on dc or ac, 60 cycles or less. Available in three different chuck sizes: 1/4, 5/16, and 3/8 in., and in two different handles—D-shape and drop handle.

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800 ton Verson Hydraulic press used by Stolper Steel Products Corp., Milwaukee, to form military gasoline cans. (Photo Courtesy Milwaukee Sentinel.)

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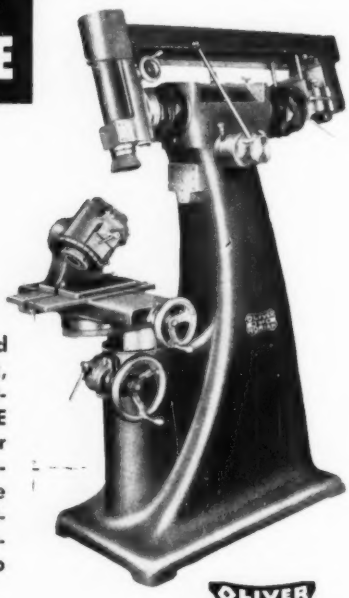

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Edmund Scientific Corp., Dept. 101, Barrington, N. J.

NEW BOOKS

DOLLAR SAVINGS THROUGH STANDARDS. —*Published by the American Standards Association, 70 East 45th St., New York 17, N. Y. 32 pages. Price $1.*

Specific savings and production benefits directly attributed to standardization in American industry are cited in this compilation of 140 documented case histories. The book is a printing of a report called "Survey to Obtain Data to Show Savings Derived from the Use of Standards by American Industry." It was prepared for the ECA by the ASA, to encourage European manufacturers to adopt US production methods in order to speed military preparedness and to strengthen economic self-independence.

•

ESSENTIALS IN PROBLEM SOLVING—*By Zuce Kogan. Published by the author at 724 Sheridan Road, Chicago 13, Ill. Size 8½ x 5½ in. 79 pages.*

The author subtitles his interesting book "a new book on a new idea," but in this he is only partly correct. The book is new, but the idea is one that scientists, engineers, bricklayers, and lawyers have been fumbling around with for centuries. Therein lies the reason for the book; and a good one it is.

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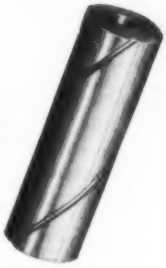

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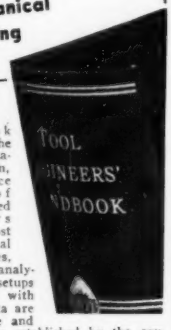

THIS handbook brings you the most modern, authoritative data on the design, fabrication, maintenance and economical use of tools and machinery used in industry. It covers product design and cost estimating, the economical selection of machines, processes, and tools, the analysis and improvement of setups and operations. Use it with complete confidence. Data are based wherever possible and practicable, on standards established by the government, professional associations and leading industrial companies.

TOOL ENGINEERS' HANDBOOK

American Society of Tool Engineers
Frank W. Wilson, Editor-in-Chief

Written by 144 authorities in the field, this massive reference, consisting of 115 big sections covering tool engineering from A to Z, has been checked and double checked from cover to cover to insure accuracy. Here are the complete, authoritative answers to your problems, brought to you in compact, easy-to-find form.

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A small selection of highlights selected at random to illustrate the scope of this Handbook:

- Describes types of machines, cutting tools, tool holders, fixtures and operations in precision production boring.
- Includes all new techniques and processes of recognized acceptance including Powder Metallurgy, Investment Casting, Plastic Joining of Materials, etc.
- Conventional tables of feeds, speeds and cuts modernized to bring them into line with latest cutting-tool materials and cutting practices.
- Treats, process-wise, such topics as Plaster Mold Casting, Superfinishing, Rotary Swaging, Sheet and strip cold roll forming, Die Hobbing, etc.
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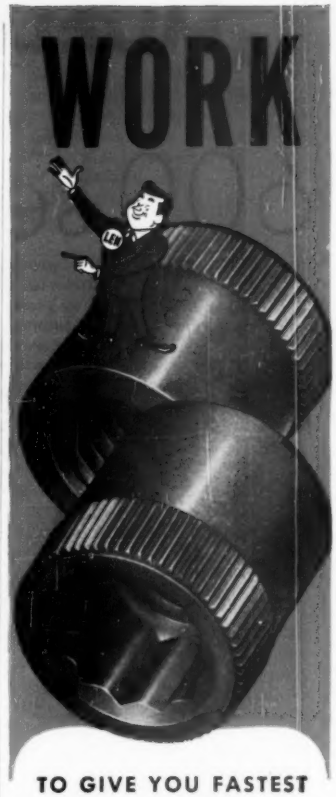

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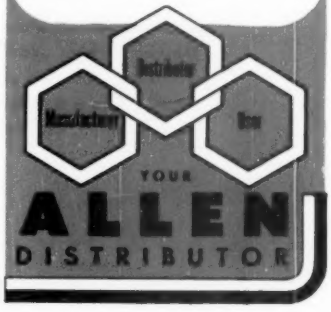


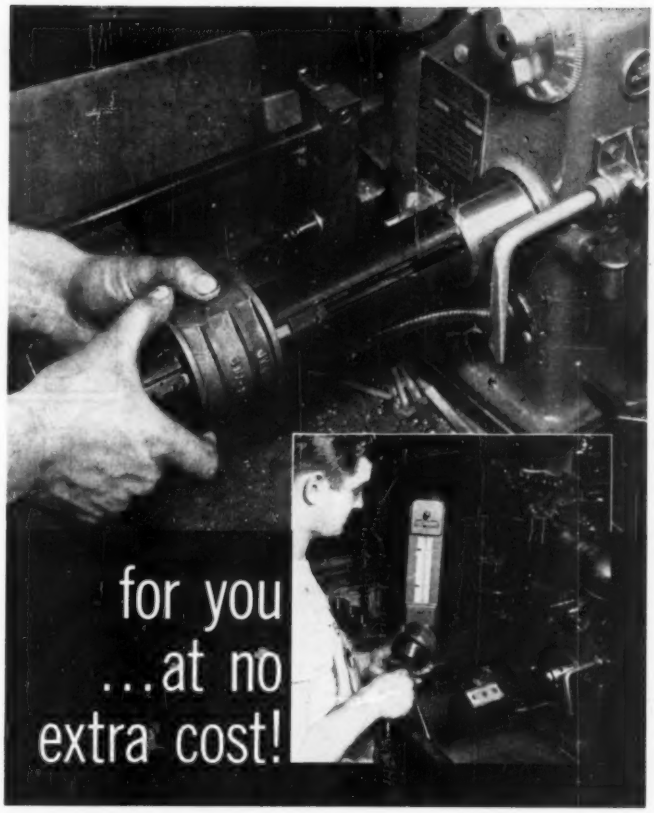
sewing a seam—can be solved by making a number of inefficient stabs at it—that is, if the problem has a solution. But to find a solution without waste motion, without cut and try, without relying on memory of identical problems; this is the ideal situation, and one that all kinds of education strive to establish.

The author suggests that the way to solve a problem is to convert it into a general problem, find a general solution, then convert the general solution into a practical one. This is the approach to a problem that is often implied when a good teacher tells a student how to work (not necessarily on classroom work). This same approach is what a successful engineer or scientist adopts—whether he knows it or not—when and if he steps out of the copy-cat class and begins thinking on his own.

Of course anyone who intends to solve practical problems must have certain basic information before he starts. His education, past experiences, and references to the experiences of others are all groundwork. But included in this groundwork should be his own realization that to accomplish a mental job blocked by ignorance requires some very clear thinking along the lines the author follows.

One example in the book may be of interest here. Consider the basic similarities between a cheese knife and an appendix. On the surface there are none, yet, in one respect, the problem is identical. An ordinary silver cheese knife piles up bits of cheese on both flats of the blade as it cuts, therefore making cutting more difficult. The edge of the blade is useful, for it does the cutting; but the flats are a hindrance. The appendix is a hindrance to the human body when it becomes sick. Therefore, the elimination of both the appendix and the flats of the knife are sensible solutions to basically the same problem, but they are specifically different answers to different specific problems. The doctor cuts out a sick appendix in the operating room; and a smart cheese-knife manufacturer throws away the flats on his knife and markets one that looks like a coping saw.

Many other problems can be generalized into the same category. The trouble is that unless the problems are generalized, it is often difficult to see offhand that the problem is one of elimination of useless equipment, and not some other basic problem. Reading this book and absorbing the author's ideas might be a good idea for anyone who has trouble in making decisions.



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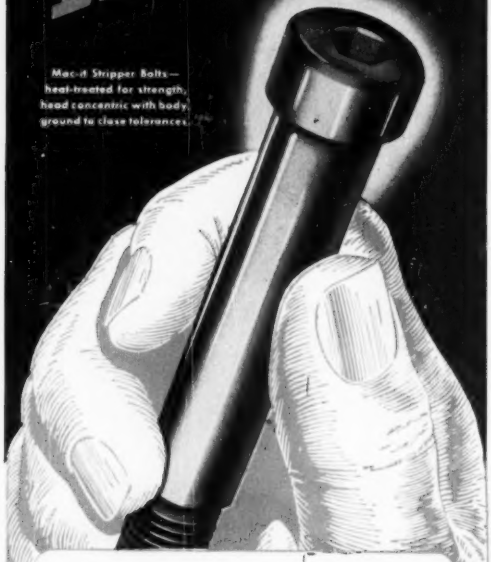

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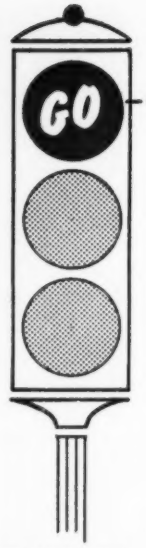

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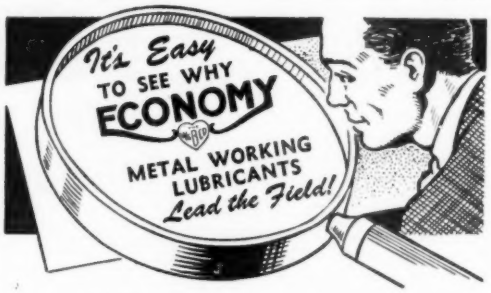

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Small Business Gets 21% of Defense Dollar, Munitions Board Reports

WASHINGTON—Small business is getting its share of defense contract dollars—that's the gist of a Munitions Board report put out this week covering contract placement during fiscal 1951. The report was made to Senate and House Small Business Committee, Congressional protectors of small business.

Of the 100 biggest defense contracts awarded, Munitions Board reported only thirty-seven went to industrialists in the big-business category. Dollar value of contracts awarded the 100 biggest contractors was $18.2 billion. Of this amount firms employing fewer than 500 persons got $6.4 million or 21% of total dollar value of all military contracts.

Munitions Board hasn't come up with any figures to show where contracts have gone since last July 1. At that time, military contract letting was at the rate of $2.1 billion a month. In October the figure jumped to $5.9 billion as procurement officers got out contracts that had been held up until money was available. Contract authorizations for the Military for fiscal 1952 will total $53 billion, which will mean a monthly rate of roughly $4.4 billion. Small business is expected to get its proportionate share in 1952 in line with pattern set in 1951.

Of the first nineteen companies on the list, ten are aircraft companies; five are major tank-automotive program contractors; and the remaining four are suppliers of electronic and other equipment for the aircraft and tank-automotive programs.

General Motors and its subsidiaries topped the list with contracts amounting to $2,372,500,000 or 8% of the total authorized for all military contracting.

Second was United Aircraft Corp. with $1.2 billion or 4.1% of the total, followed by Douglas Aircraft Co., Grumman Aircraft Engineering Corp., General Electric Co., and Republic Aviation Corp., each with contracts valued at 2 to 2.5% of total procurement awards.

Small firms, generally, must act as subcontractors not prime contractors for large complex types of military equipment.

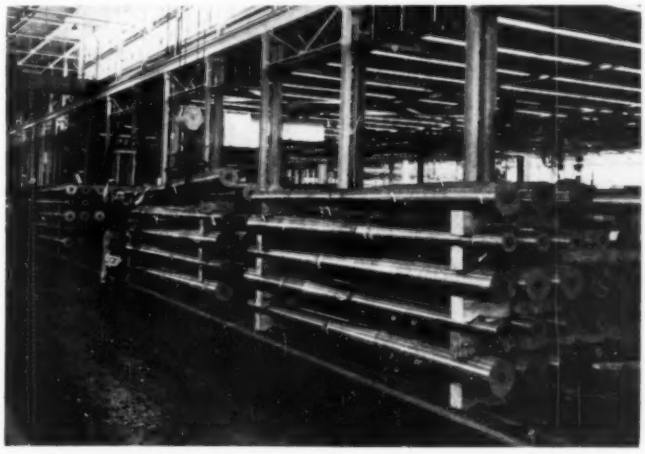
Three companies were cited as examples of subcontracting:

General Motors Corp., the largest prime contractor, reported that in peacetime 112 plants of its manufacturing divisions are dependent on more than 12,000 outside firms for materials, supplies, parts and services. During World War II the number was 19,000.

A study of $442 million in Air Force prime contracts awarded to Republic Aviation Corp. in fiscal year 1951 disclosed that Republic is retaining 48% for work done in its own plants, and spending 52% with outside firms, including 7% with large and small suppliers of materials, equipment and services, and 35% for subcontracted parts and components. Of Republic's 176 first-tier subcontractors on these contracts, 133 are small firms. Four of its largest first-tier subcontractors reported that they have placed subcontracts with eighty-five additional small firms, and with fourteen large concerns. In short, Republic and four of its 176 subcontractors are bringing a minimum of 275 firms into the work of fabricating parts, and 218 or 79% of these are small independent plants with less than 500 employees. Other firms are producing parts for Republic's other subcontractors.

General Electric Co. reported that 67% of prime contracts awarded to its Aircraft Gas Turbine Division plants at Lynn, Mass., and Lockland, Ohio, between June, 1950, and June 1951, went to outside firms. The remaining 33% was retained by General Electric for supplies from other departments of the company and for work done by the Aircraft Gas Turbine Division. Some 4070 outside firms provided materials, parts, or services to the two plants. Reports from 900 of these suppliers indicated that 80% of them employed fewer than 500 persons.

It is likely that there are duplications in these totals from the subcontractor reports, Munitions Board indicated, since any one firm may supply several of the first-tier subcontractors. The survey, however, showed that the prime contract dollars are widely dispersed outside the plants of the prime and first-tier contractors. Other studies of major contract operations have indicated a similar trend.



Partially machined tubes for 90-mm. tank cannon are stored thus in the Oldsmobile Gun Plant at Lansing, Mich. The overhead crane is needed to move the 15-ft tubes, which weigh more than a ton when they are received as steel forging from the government. The finished gun, consisting of tube, breech block and breech ring, is shipped at the direction of the Army Ordnance Corps, with which Oldsmobile has a contract

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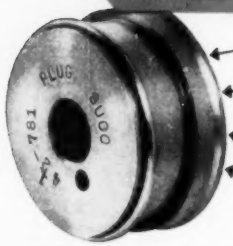

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Renegotiation Board to Set Up 4 Regional Offices

WASHINGTON — You won't have to deal directly with Washington when your Government contract comes up for renegotiation. Reason: the Renegotiation Board last week set up four regional offices to work directly with contractors.

The offices, to be activated shortly after the first of the year, will be in New York, Washington, Chicago, and Los Angeles. Plan is to have a Renegotiation Board in each region, consisting of five members plus staff. Army, Navy, Air Force, and GSA will appoint one member to each board. Chairman will be named by Washington.

It will be a break for contractors. Reason is that regional boards will eliminate establishment of separate Renegotiation Boards for each of the 15 Government Agencies whose contracts are subject to excessive profits recapture. That way, your contract will get reviewed more rapidly, subject to one policy instead of several.

Minneapolis-Moline to Operate Reactivated Shell Plant

MINNEAPOLIS, Minn. — The Minneapolis-Moline Co. has been awarded a contract for the reactivation and operation of a government-owned shell plant located in the Twin-Cities arsenal area at New Brighton, Minn. The reactivation and equipment contract alone comes to approximately $2 million.

The plant has been in a standby condition since the close of World War II. Present plans call for the plant to produce artillery shells.

Production schedules are still tentative but the company estimates 700 employees on a one-shift basis will be needed. The plant will be opened early in 1952 and will be under the management of W. C. MacFarlane, Jr., vice president of the company.

York Corp. to Make Gun Parts For Ordnance Arsenal

YORK, Pa.—York Corp. has been awarded a contract to produce breech rings for the Army's 90-mm gun. Dollar value of the contract was not disclosed, other than that it is in excess of $1 million.

The parts are to be made for the Watervliet, N. Y. Arsenal with the contract being supervised by the Philadelphia Ordnance District.

Manufacture of the breech rings has been assigned to York's Grantley plant and is expected to get underway early in 1952.

In addition to making the breech rings which are a major part of the 90-mm gun, the air conditioning company is now in the tooling stage on a contract to build rocket motors for the Navy.

Subcontracting Less Trouble Than Prime Awards

NEW YORK—How does a manufacturer decide that he wants to subcontract rather than go after a prime contract? Some hints are given in a chapter on subcontracting in "Getting Military Work" by Walter Lord, published by Business Reports, Inc., 225 W. 34 St., New York.

Handling a prime contract, the author points out, requires a lot of legal and paper work costly in money and manhours to handle. Subcontract dealings may be simpler, more direct. A prime contractor has to worry about his subcontractors getting material needed, while the subcontractor gets help from the prime to solve priorities and material problems.

Also, the author says, "company is in a much better position if it has the engineering talent to master a series of difficult subcontracting jobs. It stands a better chance to hold its jobs against competition and to get better treatment on renegotiation if it does a difficult job well. Many prime contracts are easy to do or to get done by tapping available subcontracting facilities. This means that as time goes on, the price will be traded down and renegotiation may be more severe. By picking a number of subcontracting jobs for which a company's experience and facilities are well adapted, a significant operation can be started on a small basis and expanded as much as required."

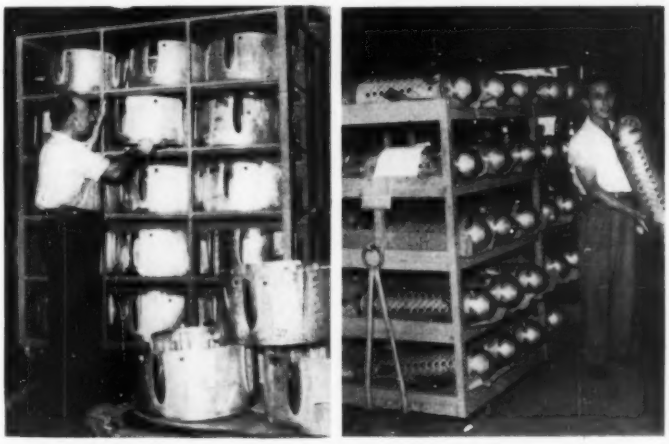
"Getting Military Work" puts together in one place a wealth of other material of value to the prime as well as to the subcontractor, including information on what is wanted by the military, how military buying works, pooling efforts with other firms, and government help on military contracts.

Cadillac's Walker Tank Contract Increased to $750 Million

CLEVELAND—Cadillac Motor Car Div., GMC, has received a contract for an estimated one-third increase in commitments to build Walker Bulldog tanks. With this substantial addition Cadillac's original government order of $112 million now approaches three-quarter billion dollars.

This is the fourth major supplement to Cadillac's original commitment for T41E1 tanks.

E. N. Cole, plant manager of the tank plant here, estimated that production will be stepped up about 60%. "The addition of both skilled and unskilled productive workers from the surrounding area will be required to meet this new schedule," he said. He also indicated that the additional order will be reflected to a great extent in increased second and third shift production, as well as a sizeable dollar volume increase to many of the nearly 3000 Tank Plant suppliers.



Custom-tailored racks for moving odd-shaped parts at Ryan Aeronautical Co., San Diego, Calif., have been designed to minimize damage to the parts themselves. The racks take up very little more space than the old tote carts and can handle many times as many parts. They prevent jostling of intricate designs, each piece having its own allotted compartment. An aircraft subcontractor specializing in exhaust systems, Ryan has contracts with General Electric, Pratt & Whitney Aircraft, and Continental

International Harvester Tooling To Make Garand Rifle

WASHINGTON—International Harvester Co., Chicago, has been awarded a contract from the U.S. Army for the quantity production of the M-1 Garand semi-automatic rifle. Dollar volume was not revealed but was said to be in the multi-million-dollar class.

This move apparently ends for the present a dispute with the British over whether the British .28 cal rifle should be adopted as standard equipment for NATO forces. The major factor in deciding the argument was British delivery dates on their rifle.

The Army contract indicates that the British weapon is no longer under consideration. The order was the first rifle contract placed since World War II.

International is now tooling its Evansville, Ind., plant for manufacture. First deliveries are expected early next year.

The Garand rifle has undergone many refinements since its adoption. One of the main improvements is a gunsight that enables a soldier to aim quickly and fire rapidly. It will fire about 43 rounds per min with high penetrating power.

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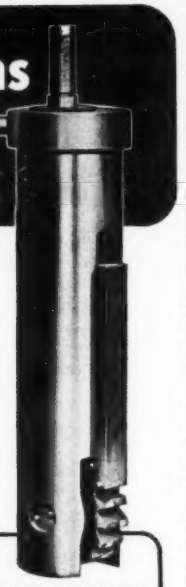

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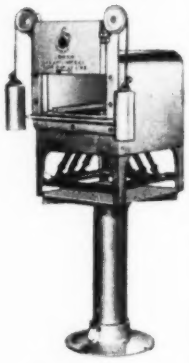

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Small Plants Head Wants To End "Set-Off" Practice

WASHINGTON — A move to end harmful "set-off" restrictions against small business firms by large prime contractors has been initiated by Small Defense Plants Administrator Telford Taylor.

The "set-off" gives prime contractors the power to withhold payments on subcontracts as a means of recovering debts or claims due from the subcontractor on other accounts.

In a letter to the heads of nine Federal agencies having procurement functions, Taylor recommended the immediate elimination of the "set-off" system in connection with Government contracts.

In releasing the letter, Taylor said the "set-off" is "an unhealthy arrangement between the prime contractor and subcontractors." He warned if the practice is continued it might easily result in "severe bottlenecks throughout industry and jeopardize our defense effort."

Subcontractors frequently negotiate bank loans by putting up their subcontracts as collateral. But banks are reluctant to loan money to subcontractors because of the "set-off" provision in their subcontracts.

Taylor said the "set-off" is a severe handicap to many small firms seeking loans necessary to fulfill their contracts.

He added, "There's general agreement among Government officials that steps should be taken to eliminate the "set-off" system."

Army Transport Contracts for Three Prototype Ships

WASHINGTON—The Army Transportation Corps has placed orders for three prototype vessels—a tanker, a dry cargo vessel, and a refrigerated ship—to be used in the corps transportation services on inland and coastal waters.

The tanker will be constructed by Liberty Dry Dock, Inc., Brooklyn, N. Y. The refrigerated vessel will be built by Higgins, Inc., at New Orleans, while the dry cargo ship will be constructed by the Puget Sound Bridge & Dredging Co., Seattle, Wash.

All three ships will be made from the same type hulls which will be 204-ft long, 34 ft in beam, and 19 ft in draft. Each will be 1200 gross ton and have 1500 deadweight-ton capacity.

LATEST DEFENSE CONTRACTS

ARMY ORDNANCE AWARDS

Tank-Automotive Center, Detroit

United Motors Service Div., GMC, Detroit—batteries, $144,756.

Gould-National Batteries, St. Paul, Minn.—batteries, exceeds $250,000.

Lipe-Rollway Corp., Syracuse, N. Y.—tank & combat vehicle parts, exceeds $250,000.

J. B. Beaird Co., Inc., Shreveport, La.—tank and combat vehicle parts, $140,139.

American Generator & Armature Co., Chicago—tank and combat vehicle parts, exceeds $250,000.

Detroit Michigan Stove Co., Battle Creek, Mich.—tank and combat vehicle parts, exceeds $250,000.

Active Gear Co., Chicago—tank and combat vehicle parts, exceeds $250,000.

Maxim Silencer Co., Hartford, Conn.—tank and combat vehicle parts, exceeds $250,000.

Detroit Arsenal

Warner Machine Products, Inc., Muncie, Ind.—final drive couplings, exceeds $250,000.

Crane Co., Chicago—steel castings, $155,227.

Pratt & Letchworth Co., Inc., Buffalo, N. Y.—steel castings, $126,472.

Eclipse Pioneer Div., Bendix Aviation Corp., Teterboro, N. J.—indicator, O-ring, receptacle, transmitter, exceeds $250,000. Master junction box, exceeds $250,000.

Rose Truck & Caster Co., Detroit—combination drill and reamer, $100,464.

Colonial Broach Co., Detroit—special hydraulic machine, $139,677.

Detroit Ordnance District,

Oldsmobile Div., GMC, Lansing, Mich.—rocket assemblies, exceeds $250,000.

Rochester Ordnance District

Cleveland Container Co., Ogdensburg, N.Y.—ammunition containers, $143,405.

Van Der Horst Corp. of America, Olean, N.Y.—chrome plating of gun bores, 90-mm gun tubes, $205,765.

Springfield Ordnance District

Westinghouse Electric Co., East Springfield, Mass.—barrel liner assemblies, $114,916.

Montague Rod and Reel Co., Montague, Mass.—primer percussions, $248,170.

Remington Arms Corp., Bridgeport, Conn.—cartridge tracers, exceeds $250,000.

Royal Typewriter, Hartford, Conn.—boosters, exceeds $250,000.

SIGNAL CORPS AWARDS

Philadelphia Procurement Agency

Dresser Equipment Co., Columbus Div., Columbus, Ohio—radio towers, exceeds $250,000.

Emerson Radio and Phonograph Co., New York—radio sets, exceeds $250,000.

General Electric Co., Syracuse, N. Y.—machinery and equipment, $116,000.

Motorola, Inc., Chicago—radio sets, exceeds $250,000 on each of 2 contracts.

Radio Corporation of America, Camden, N. J.—radio sets, exceeds $250,000.

Specialty Battery Co., Madison, Wis.—battery packs, $175,139.

Garod Radio Corp., Brooklyn, N. Y.—controls, exceeds $250,000.

Parkchester Machine Corp., New York—mountings, exceeds $250,000.

Phelps Dodge Copper Products, New York—wire reels, wire spools, exceeds $250,000.

Delco Radio Div., GMC, Kokomo, Ind.—receiver, transmitter, exceeds $250,000.

James Heddons' Sons, Dowagiac, Mich.—mast sections, $114,035.

Kellogg Switchboard & Supply, Chicago—ringer sets, exceeds $250,000.

Teletype Corp., Chicago—teletype parts, exceeds $250,000.

Triplett Electrical Instrument Co., Bluffton, Ohio—tube testers, exceeds $250,000.

ARMY ENGINEER AWARDS

Chicago Procurement Office

Gar Wood Industries, Inc., Findlay, Ohio—spare parts, their equipment, $124,000.

Caterpillar Tractor Co., Peoria, Ill.—spare parts, their equipment, exceeds $250,000 on each of three contracts, spare parts, $128,500.

Nordberg Mfg. Co., Milwaukee, Wis.—gasoline-driven hammer, $154,083.

United Motor Service Div., GMC, Detroit—spare parts, their equipment, $165,000.

Little Giant Tree Feller Corp., Dallas, Tex.—tractors and attachments, exceeds $250,000.

Minneapolis Moline Corp., Minneapolis, Minn.—tractors, wheel, exceeds $250,000.

J. I. Case Co., Racine, Wis.—tractors, wheel, $135,000.

Pittsburgh District Engineer

Ceco Steel Products Corp., Chicago—airplane landing mats, exceeds $250,000.

Farm-Rite Implement Co., Central Architectural Iron Works, Chicago, joint venturers—floating bridges, exceeds $250,000.

General Tire and Rubber Co., Akron—pneumatic floats, 12 ton, exceeds $250,000.

NAVY AWARDS

Navy Purchasing Office Washington 25, D.C.

Northwestern Motor Co., Eau Claire, Wis.—warehouse tractors, exceeds $250,000.

Mercury Mfg. Co., Chicago—gas tractors, $244,611.

Rustless Division, Armco Steel Corp.—stainless steel, $107,526.

Century Tool Co., Palmyra, N. J.—tool sets, $239,096. 2 contracts.

Carboloy Dept. of General Electric Co., Detroit—cemented carbide, running contract.

(Continued next page)

U. S. Steel to Reopen Naval Ordnance Plant

SOUTH CHARLESTON, W. Va.—United States Steel Co. is now in the process of resuming operation of the Naval Ordnance plant here. At the Navy's request, the plant will be operated principally for the heat-treating of steel armor plate produced at U. S. Steel's Homestead, Pa. plant.

W. C. Steele, formerly a supervisor at the Homestead Works has been named plant manager.

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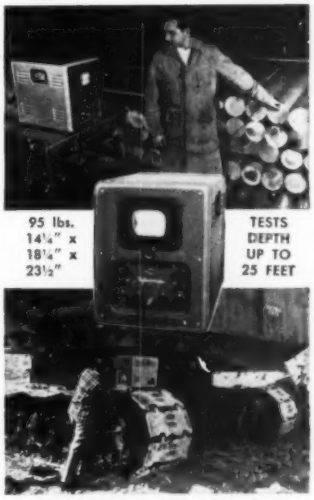

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NAVY AWARDS . . . . . continued

Bureau of Ships, Washington 25, D.C.

Charles T. Brandt Co., Baltimore, Md.—welded-steel sonar domes, $178,536.

Cleaver-Brooks Co., Milwaukee, Wis.—complete boilers, exceeds $250,000.

Joy Mfg. Co., Pittsburgh—tube-axial and vane-axial fans, $127,954.

ILG Electric Ventilating Co., Chicago—centrifugal blowers, $167,503.

York Corp., Washington—condensing unit for air conditioning, $196,886.

Carrier Corp., New York, N. Y.—condensing unit for air conditioning, $191,176.

J. H. Keeney & Co., Inc., Chicago—power supply units, $245,780.

Fellows and Stewart Inc., Wilmington, Calif.—harbor tugs, exceeds $250,000.

American Boiler Works, Erie, Pa.—harbor tugs, exceeds $250,000.

Pilot Marine Corp., New York— salinity indicator panels, $144,772.

Ships Parts Control Center Mechanicsburg, Pa.

Warren Steam Pump Co., Inc., Warren, Mass. — repair parts for pumps, exceeds $250,000.

Pacific Coast Div., A. O. Smith Corp., Los Angeles—electric motors and repair parts, special tooling, $120,915.

Sterling Engine Co., Buffalo, N. Y.—repair parts, diesel engines, exceeds $250,000.

Bureau of Ordnance Washington 25, D.C.

Moe Light, Inc., Ft. Atkinson, Wis.—plant equipment, exceeds $250,000.

A. G. Spaulding & Bros., Inc., Chicopee Falls, Mass.—plant equipment, exceeds $250,000.

Knapp-Monarch Co., St. Louis—plant equipment, $164,205.

Electric Auto-Lite Co., Toledo—plant equipment, exceeds $250,000.

Dazey Corp., St. Louis—plant equipment, exceeds $250,000.

Cleaver Brooks Co., Milwaukee, Wis.—bomb cookers, exceeds $250,000. 2 contracts.

Ekco Products Co., Chicago—plant equipment, exceeds $250,000. Steel cartridge cases, exceeds $250,000.

Rheem Mfg. Co., Richmond, Calif.—plant equipment, exceeds $250,000.

Bethlehem Steel Has $25 Million Contract for Four Supertankers

QUINCY, Mass.—Contracts for four supertankers, involving an estimated expenditure of $25 million have been awarded the Quincy yard of Bethlehem Steel Co.

Two of the vessels will be constructed for the Orion Shipping & Trading Co., Inc., New York. Bethlehem did not disclose who ordered the other two.

Keels will be laid in mid-1952. The tankers each will be of 29,250 ton, will be 644-ft long, 85-ft wide, and cruise at sixteen knots. Each will have capacity for over 10½ million gallons of fuel.

Newest Sabre Jet, North American Aviation's F-86D all-weather interceptor, shown in flight. The new "D", the Air Force's only single-place interceptor, is equipped with an afterburner for extra thrust, and is capable of reaching service ceiling in seconds

Tap-Rite Products Corp., Hackensack, N. J.—fuse sleeves, exceeds $250,000.

Armstrong Cork Co., Lancaster, Pa.—machine tools and equipment for 20-mm API projectiles, exceeds $250,000.

Electric Storage Battery Co., Washinton—torpedo propulsion batteries, $125,350.

NECO Ordnance Co., Winona, Minn.—plant equipment, exceeds, $250,000.

Mullins Mfg. Co., Salem, Ohio—plant equipment, exceeds $250,000.

York Corporation, York, Pa.—plant equipment, $118,750.

United States Testing Co., Hoboken, N. J.—portable shields, test sets, and timers, $183,914.

Construction Battalion Center, Port Hueneme, Calif.

Rome Grader Corp., Rome, N. Y.—motorized road grader, exceeds $250,000, on each of 2 contracts.

Stran Steel Div., Great Lakes Steel Corp., Detroit—prefabricated buildings, exceeds $250,000.

NAVAL AVIATION AWARDS

Bureau of Aeronautics, Washington 25, D.C.

Seth-Thomas, Thomastown, Conn.—accelerometers, $151,500.

Air Materials Center, Philadelphia

Gisholt Machine Co., Madison, Wis.—turret lathes, exceeds $250,000.

Monarch Machine Tool Co., Sidney, Ohio—engine lathes, $169,191.

Aviation Supply Office, Philadelphia, Pa.

Westinghouse Electric Corp., Philadelphia—maintenance parts, $112,753.

Permoflux Corp., Chicago—headsets, dynamic—$190,111.

Radiant Mfg. Corp., Chicago—aerial targets, $230,200.

Maxon Engineering Div., W. L. Maxon Corp., New York—aviation armament spares, exceeds $250,000.

General Electric Co., Philadelphia—services and material, $250,000.

Chance-Vought Aircraft Div., United Aircraft Corp., Dallas, Texas—aviation armament, exceeds $250,000 on each of two contracts; maintenance parts, $214,658.

AIR FORCE AWARDS

Air Material Command, Wright-Patterson, AF Base, Dayton

Fruehauf Trailer Co., Detroit—bomb dollies, exceeds $250,000.

Lombard Corp., Youngstown, Ohio—one 12,000-ton horizontal extrusion press, exceeds $250,000.

Liquid Carbonic Corp., Chicago—B-47 drop tank struts production, exceeds $250,000.

General Motors Corp., Detroit—machinery and equipment, exceeds $250,000; R3850 engine machinery & equipment, exceeds $250,000.

Union Carbide & Carbon Corp., Kokomo, Ind.—machinery and equipment for jet engine components, exceeds $250,000.

Telechron, Inc., Ashland, Mass.—machinery and equipment, exceeds $250,000.

General Motors Corp., Plymouth, Mich.—machinery and equipment, exceeds $250,000.

Stainless Ware Co. of America, Walled Lake, Mich.—machinery and equipment, $200,000.

Guardian Electric Co., Chicago—production facilities, electrical relays, $150,000.

Pacific Airmotive Corp., Burbank, Calif.—reconditioning aircraft, $100,000.

General Electric Co., Schenectady, N. Y.—repair and modification of fire control systems, B-36, $100,000.

Goodyear Tire and Rubber Co., Akron, Ohio—wheel and brake assemblies, spare parts, exceeds $250,000.

Bendix Products Div., Bendix Aviation Corp., South Bend, Ind.—fuel injection systems, jet engine controls, carburetors and spare parts, exceeds $250,000. Wheel and brake assemblies, spare parts, exceeds $250,000.

Canadian Commercial Corp., Washington—radar sets, exceeds $250,000.

Sperry-Gyroscope Co., Sperry Corp., Great Neck, L. I., N. Y.—components, auto pilot spare parts, special tools, exceeds $250,000.

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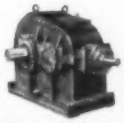
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20" table travel . . . 42" x 12" table . . . full automatic hydraulic table feed.

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Double Spindle for two milling operations at same time . . . 20" table travel . . . 42" x 12" table.

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20" table travel . . . vertical spindle with speed range 32 to 1284 R.P.M. . . . 42" x 12" table.

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32" x 9" table . . . 14" table travel . . . hydraulic table feed . . . full automatic cycle.

Speed up YOUR MILLING!

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Hand feed to table and head . . . 25" x 9" table . . . Adjustable head-counter-balance.

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Get top-speed milling with high accuracy . . . put the work on Kent-Owens Machines! They're outstandingly rugged . . . efficient . . . dependable. Designed with twin-post head mounting that assures balanced load—no chattering. Practical features throughout to help you *produce more . . . save labor . . . reduce costs!* Write for bulletins on wide range of hydraulic and hand-operated machines. Kent-Owens Machine Co., Toledo, Ohio.

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Milling Machines

"no more GAMBLING on tool steel selection"

(⅓ actual size; Selector is in 3 colors)

Here's how it works:

To use the Selector, all you need know is the characteristics that come with the job: type and condition of material to be worked, the number of pieces to be produced, the method of working, and the condition of the equipment to be used.

FOUR STEPS—and you've got the right answer!

1. Move arrow to major class covering application
2. Select sub-group which best fits application
3. Note major tool characteristics (under arrow) and other characteristics in cut-outs for each grade in sub-group
4. Select tool steel indicated

That's all there is to it!

Here's an example:

Application—Deep drawing die for steel

Major Class—Metal Forming—Cold

Sub-Group—Special Purpose

Tool Characteristics—Wear Resistance

Tool Steel—Airdi 150

One turn of the dial does it!

And you're sure you're right!!

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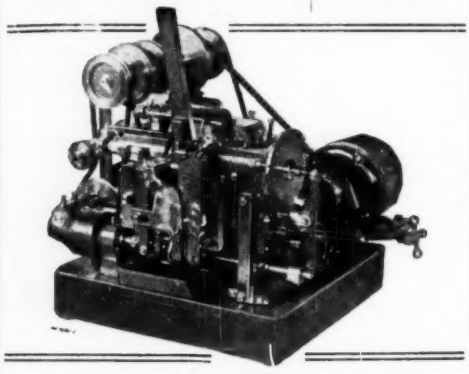

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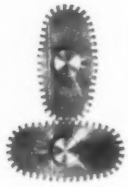

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85%

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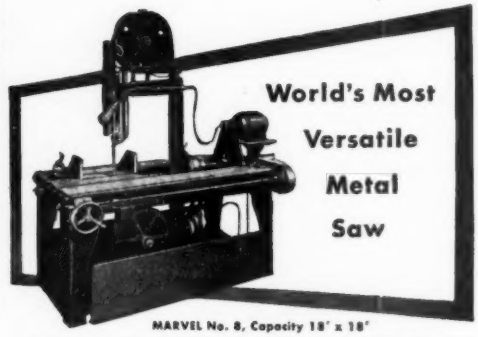

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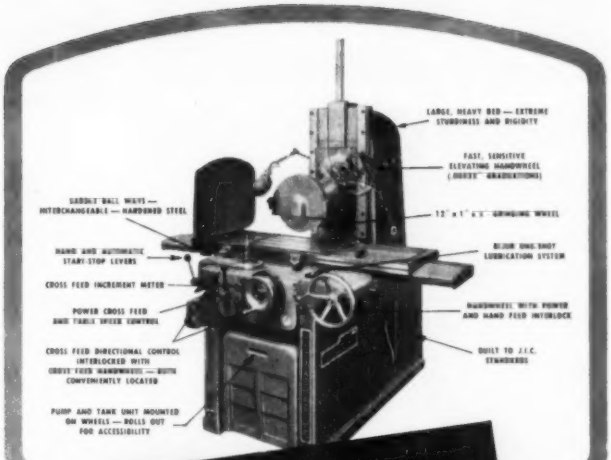
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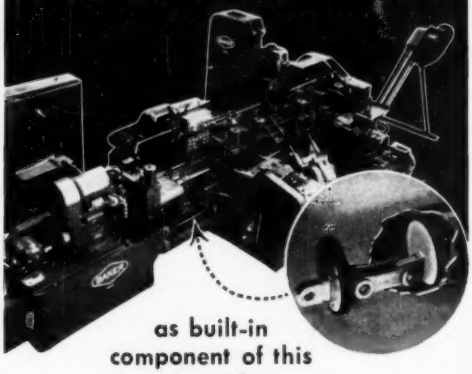

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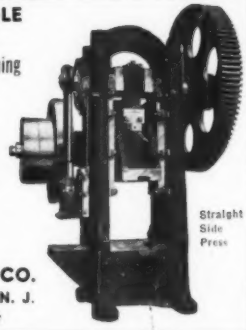

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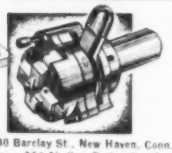

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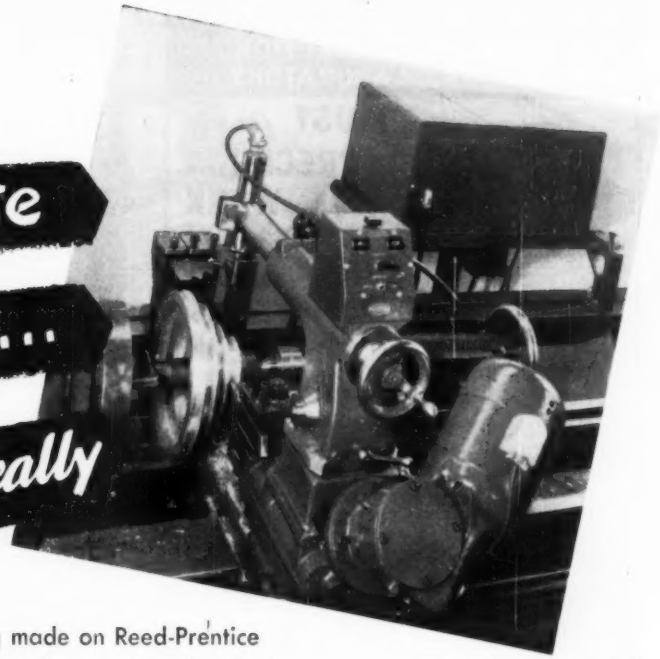

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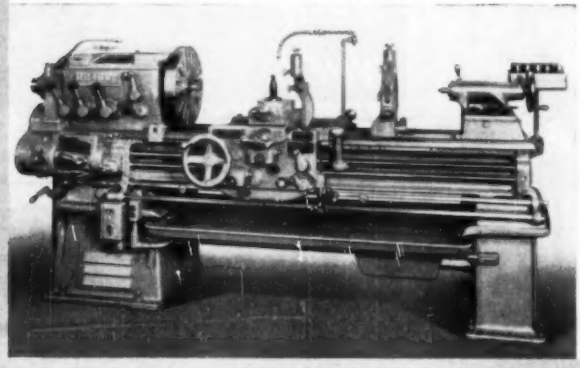

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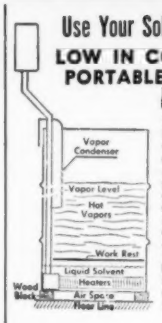

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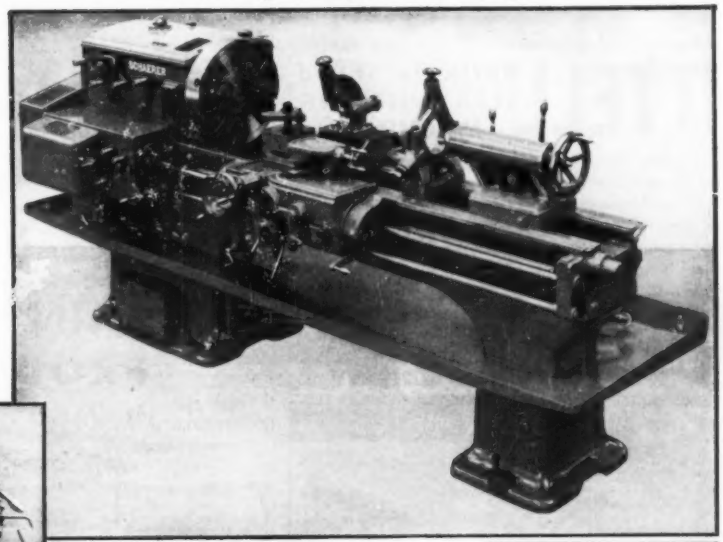

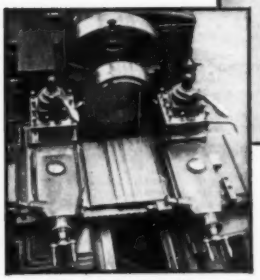

Twin cross slides for two simultaneous cuts.

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Specifically, the SCHAERER HIGH DUTY LATHE offers:

- . . . all gears in headstock are hardened and ground.
- . . . front and rear main spindle bearings lubricated by separate oiling system.
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- . . . multiple-screw cutting attachment provided on headstock.
- . . . quick-change gear and carriage equipped with one-shot oiling system.
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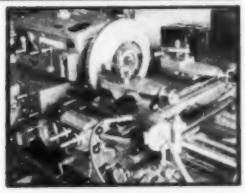
Variety of tooling combinations available.



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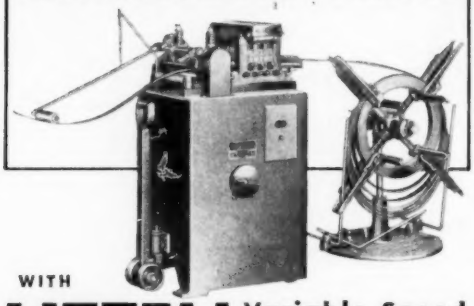

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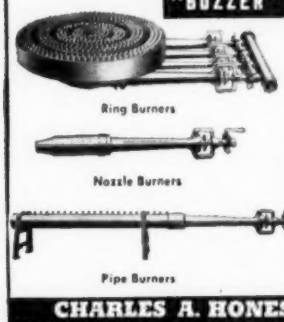

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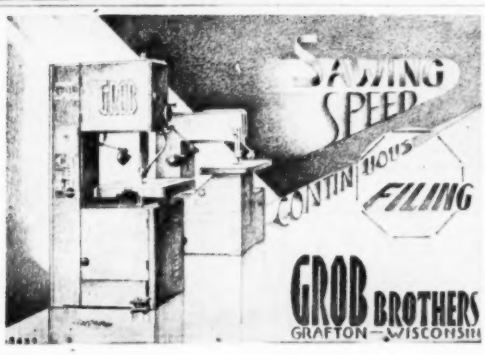

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Here are economical, sales-building methods that produce more attractive products

SUPPLIES UP - TO - DATE INFORMATION ON:

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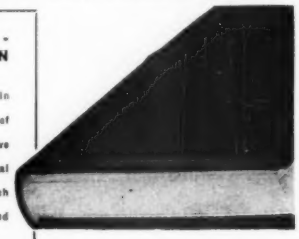
—the sales value of attractive finishes
—the economics of metal finishing
—the design of parts which require finishing
—new finishing equipment and processes
—metal finishing costs



HERE'S a manual which demonstrates the vital importance of the finishing process in the final appearance and sales appeal of a product and describes each of these processes in careful detail so that you may achieve an attractive finish as efficiently and economically as modern methods will allow. With special attention to improving results and reducing costs, the book covers all types of finish, such as galvanizing, polishing, plating, lacquering, enameling and painting—wood grain reproduction, chromium plating, and synthetic enamels, and many new finishes of a specialized nature.

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and ADOLPH BREGMAN

Consulting Engineer, Executive Secretary, Masters Electro-Plating Association

Second Edition

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- How to Minimize Cleaning Expense
- Pickling for a Better Finish
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- Recent Developments in Plating
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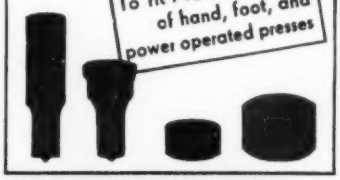

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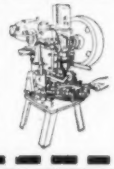

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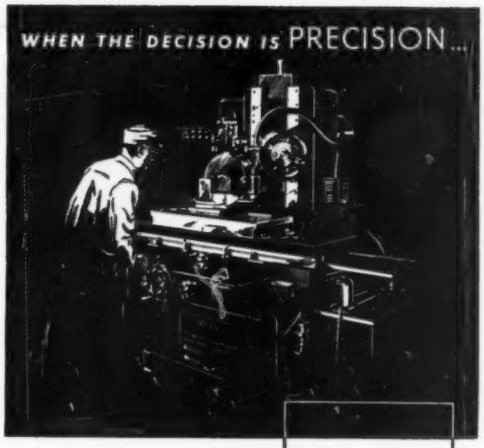

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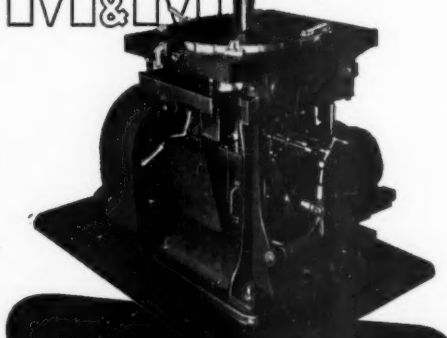

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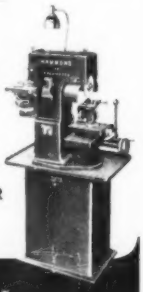

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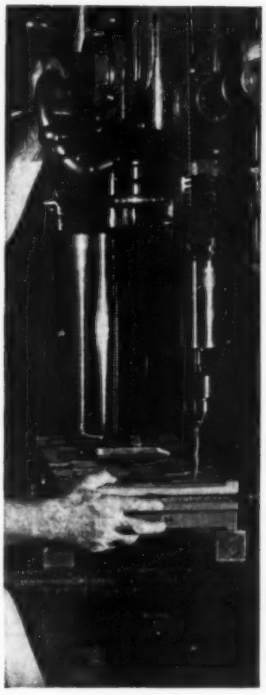

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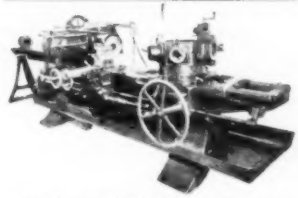
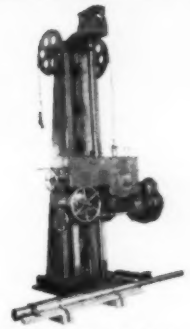
RADIAL DRILL, 5'11" Cincinnati-Bickford
RADIAL DRILL, 6'15" American, M.D.
DRILL, #525 Baker H.D., M.D., Lathe, 20 HP.
DRILL, Fosdick 16", S.S. Power Feed, M.D.
DRILL, #2 Colburn H.D., #4 M.T., M.D.
DRILL, #121 Baker Auto. S.S. Cam Operated.
DRILL, Deep Hole, Avey-Draulic #2.
DRILL, Deep Hole, Pratt Whitney #2 Gun Barrel
DRILL, Edlund #2B, 3 sadle, #2 M.T., 16".
DRILL, Cincinnati 21" with Tapping Attach.
DRILL, Nutco Multiple Spindle #12, #1 M.T.
DRILL PRESSES, Leland Gifford #2MS, 1, 2, 3, 4
DRILL PRESS, #2MS Buffalo Forge single spindle.
DRILL, Barnes, 24" S.S., #4 M.T., 1¾" cap.
DRILL PRESS, #25 Foote-Burt S.S. 24", #5 M.T.
DRILL, #2MS Leland Gifford, 4 spindle, #2 M.T.
DEEPFREEZE Motor Products 40° below zero.
FILING, #3 Theil & Sewine, M.D.
FURNACE, Westinghouse Elec. 18 KW, 2100° F. cap.
FURNACE, Machler Steam Oven, Serial #3543.
GRINDER, Disc, Besly #20S, 16" Dble. End.
GRINDER, Arier 16" Rotary Surface.
GRINDER, Cylindrical, Brown & Sharpe #2 Uni.
GRINDER, Oakley #3 Univ. Tool & Cutter
GRINDER, Heald Rotary #25, M.D.
GRINDER, Hydraulic Contour Landis Cam 5"x40".
GRINDER, Cylindrical, Norton 10"x24".
GRINDER, Brown & Sharpe #4 Univ. 12"x60".
GRINDER, Brown & Sharpe Cylindrical #10, 6x18.
GRINDER, Cylindrical, Cinci. 6x18 Filmatic.
GRINDER, Thread, Jones & Lamson #TG-615.
GRINDER, Landis Crankshaft 10x32 Hydraulic.
GRINDER, Brown & Sharpe #2 Auto. Horiz. Surface.
GRINDER, Heald #72A-3 Internal Size-Matic.
GRINDER, Pratt & Whitney 14x36 Vert. Surface.
GRINDER, Pratt & Whitney 22"x84" Vert. Surface.
GRINDER, Greenfield #12 Int. Hydromatic.
GRINDER, #51 Oliver Auto. M.D. Drillpointer.
GRINDER, #33 Abrasive Vert. Auto. Surface.
GRINDER, #22 Heald Horiz. Rotary Surface.
GRINDER, Diamond Snagging 10 HP. 24"x4¼".
GRINDER, #00 & #70 Heald Internal.
GRINDER, Landis 6"x18" Hyd. Cyl. late type.
GRINDER, Sellers Type #1A Tool, 24" wheel.
GRINDER, Porter-Cable #B-3, 10" Belt, M.D.
GEAR HOBBER, #3 Barber Colman, M.D.
GEAR HOBBER, B & S #34 Spur, 18" dia.
GEAR SHAPER, Fellows #6 High Speed.
GEAR SHAPER, Fellows #7 High Speed
HAMMER, Rochester Hispeed, all sizes M.D.
HAMMER, Bradley 200# Rubber Cushioned Helve.
HEADER, Manville #1 S.S.S.D. Cold, 3/16".
AIR MOTOR HOIST, Ingersoll Rand 2000# cap.
ELECTRIC HOISTS, 500-2000 lbs. Whiting, NEW.
KEYSEATER, #5 Mitts & Merrill, Giant, M.D.
KEYSEATER, #6 Mitts & Merrill Giant M.D.
LAPPER, 2F Norton Vert., M.D., late type.

BENDING ROLLS

Hilles & Jones #6 Pyramid Type Motor Driven Plate Bending Rolls. Size—14'x½" Plate. Top roll—22" dia. Lower rolls—15" dia. Imm. Deliv.

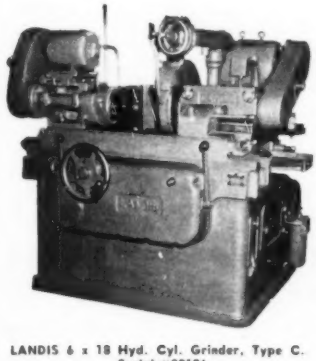


#3A WARNER & SWASEY Turret Lathe, M.D., Bar Feed.



#11 Ryerson Horizontal Drilling and Boring Machine, 5½" diam. spindle.

LATHE, Le-Swing 8"x108", M.D., A.C.
LATHE, Porter-Cable #15" Geared Head Prod.
LATHE, Hendey 12"x5', Q.C.G. Taper Attach.
LATHE, LeBlond 14"x6', Q.C.G.
LATHE, Hendey 14"x8' Q.C.G. Taper Attach.
LATHE, Lodge & Shipley 16"x6', Q.C.G., Grd. Hd.
LATHE, American 16"x6' Q.C.G., Grd. Hd.
LATHE, Lehman 18"x7' Q.C.G., M.D.
LATHE, Lodge & Shipley 18"x8', Q.C.G., Gr. Hd.
LATHE, American 18"x10' Q.C.G., Grd. Hd.
LATHE, South Bend 18-29"x6' Gap Bed, Q.C.G.
LATHE, Hendey 20"x10' Q.C.G., Taper Att.
LATHE, Reed-Prentice 20"x10' Grd. Hd.
LATHE, LeBlond 22"x10' Q.C.G., M.D.
LATHE, Putnam 24/32"x12' Q.C.G., M.D.
LATHE, LeBlond 24"x14' Q.C.G., Grd. Hd.
LATHE, Lodge & Shipley 26"x14', Q.C.G., M.D.
LATHE, McCabe 26-48"x18' Double Spindle Lathe.
LATHE, Bridgeford 27"x12' Geared Head, M.D.
LATHE, Bridgeford 32"x10' Q.C.G., Grd. Hd.
LATHE, Pond 36"x108" Grd. Hd. With Equip.
LATHE, Buffing Dble. End #PMT5, Devine Bros.
LATHE, Turret Oster #601 WD Rapiduction.
LATHE, Turret #1 Bardons & Oliver Electric Head.
LATHE, Turret, #2 Simmons Vari Drive 220 V.
LATHE, Turret, #4 Warner & Swasey Univ. 1½".
LATHE, Turret, #6 Warner & Swasey Grd. Hd. Ram Type, Bar Feed, Motor in base.
LATHE, Turret #2 Cinci. Acme Univ. Geared Head.
LATHE, Turret, #3A Warner & Swasey Univ.
MILL, Nichols, Hand, Coolant, M.D. Late Type.
MILL, #2 Pratt & Whitney Prod. Duplex, M.D.
MILL, 2A Brown & Sharpe Horiz. Univ., M.D.
MILL, #4B Brown & Sharpe H.D., Horiz. M.D.
MILL, #14 Garvin Plain Horiz., M.D.
MILL, #0Y Brown & Sharpe Plain Horiz., M.D.
MILL, Van Norman M.D. Hand Mill, late.
MILL, Cinc. Horiz. #3, #4, #5, High Power.
MILL, Cinc. Vert. #3, High Power, REBUILT.



LANDIS 6 x 18 Hyd. Cyl. Grinder, Type C. Serial #29196.

MILL, Cinc. 18" Mfg. Type with Vert. head, Late.
MILL, #0-8 Cinc. Vert. & Horiz. Prod. Late.
MULT-MILLER, U.S. Tool #MM-1-6, Auto. Prod.
MILL, #30H Sundstrand Two Spindle Hvd.
MILL, PLANER, Ingersoll 42x36x12, 4 heads.
MILLING MACHINE, Kempsmith #2 Horiz. Univ.
MILLING MACHINE, LeBlond #4, Horiz. Univ.
MILLING, Brown & Sharpe #1½ Horiz. Univ.
MILLING MACHINE, Kempsmith #2 Horiz. Univ.
MILLING, Brown & Sharpe #2 Horiz. Univ.
MILLING MACHINE, Van Norman #2 Duplex.
MILLING MACHINE, K & T #2B Horiz.
NIBBLER, Gray Turret Type ¼"x24" cap.
OZALID Model "F" Whiteprint Machine.
THREADING, Staybolt Lassiter Millholland 1½".
THREAD MILLER, Lees Bradner #40A Automatic.
THREAD MILLER, Plas-O-Mill #3 Planetary Form & Thread Semi-Automatic Milling Machine.
PAPER SHREDDER, #10 Mitts & Merrill, M.D.
PLANER, Gray 30"x30"x10' A.C. Motor Dr.
PLANER, 48"x48"x12' Cleveland Openside.
POWER PRESS, Bliss #164 Open Back.
POWER PRESS, Bliss #3A S.S. Dble. Crank Grd. 45 tons, 4" stroke, 36"x24" Bed Area.
POWER PRESS—Bliss-Consolidated #163-B Straight Side Dble. Crank, 45 tons.
PRESS, #78½ Bliss S.S. 9½" Str. M.D.
PRESS, Robinson #5 O.B.I. 83 tons, M.D.
PRESS, Federal #2 O.B.I. Grd. 2" Stro.
PRESS, Bliss #18, #19, #20, #21, OBI, A.C., M.D.
PRESS Toledo 39½ S.S. 440 ton cap. 8" str.
PRESS, Waterbury-Farrell High Speed 60 tons #3W.
PRESS, 68C Bliss Double Action, 3 crank.
WHEEL PRESS, Chambersburg 400 tons cap. Hyd.
PRESS, Lucas 15 tons Power Arbor M.D.
PRESS, #68 Whitney Deep Thr. 24", foot.
PRESS, P2, P3 Ferracute M.D. Roll feed.
PANTOGRAPH, #1A Garton M.D. Engraving.
PUNCH, Hecker Turret, 8 station, cap. 2½" hole.
PUNCH, H & J #2 Sgle. End, 24" Thr., 1" thru 1".
PUNCH H & J #5 Sgle end, 48" Thr., 2" thru 1½".
RIVET SETTER, ¾" cap. Pedn. Tubular Rivet.
ROLLS, #1 Buffalo Forge Wrapping.
ROUTER, #W240D, Onsrud, Electric H.D.
COLD SAW, Espen-Lucas #700, 48" dia. blade.
CUT-OFF SAW, Yates-American #M-90.
SAW, #302 Campbell Abrasive Cut-off.
SAW, #20-C Racine Shear Cut 8"x6" cap.
SAW, NS16-10 Grob Band & Butt Welder.
SAW, Band, Tannewitz #GH-36" High Speed.
SHAPER, 16" Pratt & Whitney Crank, M.D.
SHAPER, 32" Cinci. B.G., Motor driven.
SHAPER, Columbia 32" B.G. Crank.
SHAPER, Motore 36" Draw-Cut, 4-Speed.
SHAPER, G & E 21", high duty, back geared, M.D.
SHEAR, Quickwork #A-1 Rotary 60° Throat, 18 ga.
SPRUE CUTTER, Milwaukee 36 tons, 2½" cap.
SURFACE PLATES & TABLES, all sizes.
WELDER, 200 KVA Federal, Projection.
WELDER, 75 KVA Federal, M.D., Spot.
WIRE STITCHER, Morrison and Acme, M.D.

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PORTLAND
PORTLAND MACHINE TOOL
REBUILDERS, INC.
SOUTH PORTLAND, ME.

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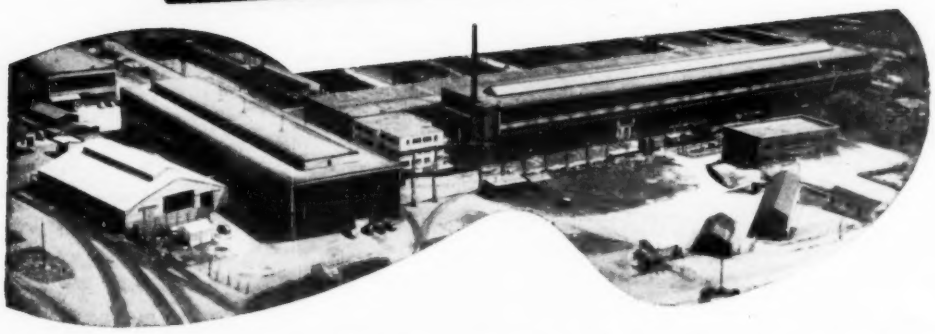

WITH SUCH COMPLETE FACILITIES AS THESE...

PORTLAND REBUILDING SERVICE is made possible through complete machining facilities such as are offered by:

—lathes from 16″ to 140″ swing
—boring lathes up to 70′ capacity
—turret lathes
—vertical turret lathes
—vertical boring mills up to 50′ capacity
—planers up to 14′ between housing and 40′ tables
—planer type milling machines
—gear hobbers up to 96″
—crane capacity to 50 tons, etc.

PORTLAND MACHINE TOOL

(Formerly Portland Machine

EAST YARD, SOUTH PORTLAND,

DESIGNERS AND BUILDERS OF SPECIAL MACHINE TOOLS, FABRICATING

PROMPT MODERNIZATION

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BRING YOUR MOST DIFFICULT REBUILDING JOBS TO PORTLAND

Give your old big planers, boring mills, millers, lathes—in fact give any machine tools, large or small, a new lease on life by having PORTLAND re-build them for maximum productivity, convenience and accuracy. PORTLAND has the "know-how," facilities and ability to give your present machine tools *new* speed, *new* output, *new* productive performance.

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EQUIPMENT, INDUSTRIAL EQUIPMENT, STEEL MILL EQUIPMENT

Eastern Rebuilt Machine Tools

THE SIGN OF QUALITY—THE MARK OF DEPENDABILITY

CYLINDER GRINDERS

No. 50 Heald Cylinder Grinder, Hydraulic, m.d., 11-18" spindles
No. 55 Heald, m.d., 15-24" spindles
No. 73 Heald Airplane Cylinder Grinders, brand new, m.d., late type

PLAIN CYLINDRICAL GRINDERS

Kwik-Way Model H Piston Turning & Grinding Machine, m.d.
6x18" Landis Plain Self-Contained, m.d.
6x18" Landis Type C Hydraulic, m.d., late
6x18" Norton Semi-Automatic, type C, m.d., late
6x30" Cincinnati Hydraulic, m.d.
8"x36" Cincinnati Saddle Type, m.d.
No. 10 Brown & Sharpe Self-Contained, m.d.
No. 11 Brown & Sharpe Self-Contained, m.d.
10x24" Landis Plain Self-Contained, m.d.
10x36" Cincinnati Hydraulic, m.d.
10x48" Brown & Sharpe, belt
10x72" Landis, m.d.
10x72" Norton, motorized
12x36" Landis, m.d.
12x48" Cincinnati Plain Self-Contained, m.d.
12x48" Modern, belted m.d.
12x96" Landis, m.d.
14x18" Cincinnati Plain Self-Contained, m.d.
14x48" Cincinnati Plain Self-Contained, m.d.
14x50" Norton, motorized
14x52" Norton, motorized
20x120" Landis Self-Contained, m.d.

DISC GRINDERS

No. 151 Besly, m.d.
Hammond Disc Grinder, Model No. 600
Model V10 Hammond Belt Sander, m.d.
No. 4 Gardner Disc Grinder, m.d.
No. 5 Gardner Disc Grinder, Double End, m.d.
No. 20 Gardner Comb. Disc Grinder & Roll Sander, m.d.
7", H.P. U.S. Elec. Tool Co. Disc Grinder, m.d., new

EMERY GRINDERS

3 H.P. Baldor Pedestal Type, 32M
1 H.P. U.S. Electrical Tool Co., Model 95
#516 Mummert & Dixon Radial Emery Grinder, m.d., 5 H.P. motor
Hammond Model 4 Carbide Grinder

UNIVERSAL CYLINDRICAL GRINDERS

6x20" Fitchburg Hydraulic Spline & Gear Grinder, m.d., latest
No. 2—12x30" Brown & Sharpe Self-Contained, m.d.
No. 2—12x30" Brown & Sharpe, belt
12x30" Landis Hydraulic, m.d., late type
12x36" Cincinnati Self-Contained, m.d.
12x48" Cincinnati, arranged for spline grinding
16x48" Cincinnati, belted, m.d.
16x24" Cincinnati Self-Contained, m.d.

GEAR SHAPERS

No. 12 Fellows Gear Shaving Machine, m.d., late
No. 6 Fellows, belt drive
No. 7, 7A Fellows, m.d.
No. 18 Fellows Gear Finishing Machine, m.d.
No. 6H Fellows, belted m.d.
No. 6HA Fellows, m.d., latest type
No. 6HS Fellows, m.d.
No. 6HSA Fellows, m.d., late type
No. 6HA Fellows, m.d., latest
No. 6HS Fellows, belt
No. 6HSA3 Fellows, m.d., late type
No. 7H Fellows, m.d., latest
No. 7S Fellows, m.d.

GEAR GRINDERS

6x20" Fitchburg Hydraulic Spline & Gear Grinder, m.d.
9" Pratt & Whitney Hydraulic Spur, m.d.
10" Pratt & Whitney Hydraulic Spur & Helical
No. 2HS Lees-Bradner Spur & Helical, m.d.
No. 13LS Fellows Gear Lapper, m.d.
SG11 Gear Grinding Machine, m.d., latest

GEAR HOBBING MACHINES

No. 12 Barber-Colman, single overarm, m.d.
No. 12 Barber-Colman, double overarm, m.d.
No. 14 Brown & Sharpe, m.d.
No. 14 Brown & Sharpe, Spur & Spiral, m.d.

GEAR CUTTERS

No. 50 Cross Universal Gear Chamfering Machine, m.d.
Gleason Spiral Bevel Gear Rougher, m.d.
3" Gleason Straight Bevel, m.d.
8" Gleason Straight Bevel, m.d.
11" Gleason Straight Bevel, m.d.
Cincinnati Gear Burnisher, m.d.
Cross Gear Tooth Rounder, m.d., 9" cap.
National Broach & Machine Co. Red Ring Gear Speeder, 10" cap.
No. 5—60" Brown & Sharpe, belted m.d.

GEAR TESTERS

Gleason Gear Tester for hypoid gears
No. 1 Brown & Sharpe Spur Gear Tester
12" Cap. National Broach & Machine Co.
18" National Broach & Machine Co.

CENTERLESS GRINDERS

No. 2 Cincinnati, m.d.
Cincinnati Valve Seat Grinder, cap. 1/8" valve stems, m.d.

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THE EASTERN MACHINERY COMPANY
1004 Tennessee Avenue, Cincinnati 29, Ohio — MElrose 1241 — CABLE ADDRESS EMCO

LATE MODEL MACHINE TOOLS . .

AUTOMATICS

No. 61 New Britain, 1⅝" cap. 1942.
1¼" RA-4 Acme Gridley Automatic. Late.
9-16" RA-6 Acme Gridley Automatic. 1942.
1-1 6" Cleveland, Model A. 1943.
2" Cleveland, Model A. 1942.

DRILLS

No. B2A Natco Single Sadl. Latest.
16 Spindle Barnes, Hydraulic. 1942.

DRILLS, RADIAL

5 20" Western. 1942.

DRILLS, SENSITIVE

No. 2B-8 Edlund. 1942.
No. 2 MA 6 Avey 2 Spindle. 1942.

GEAR EQUIPMENT

No. 6 Gleason Revacycle Generator. 1940.
No. 645A3 Fellows Gear Shaper. 1943.
No. 22 Fellows Gear Shaper. 1942.
No. 7 L.S. Fellows Gear Lapper. 1944.
Pratt & Whitney Gear Grinder. 1942.
15" Red Wing External Lapper. 1942.
Red Wing Univ. Gear Checker. 1942.

GRINDERS, CYLINDRICAL

14"x168" Norton Plain Type C. 1942.
14"x48" Landis Type C. Pl. Hyd. 1943.
10"x36" Cincinnati Plain Hyd. 1942.
10"x18" Landis Type C Pl. Hyd. 1942.

GRINDERS, INTERNAL

No. 24-30 Bryant Hydraulic. 1943.
No. 16 CP 16 Bryant Hydraulic. 1942.
No. 16-16 Bryant Hydraulic. 1942.
No. 172 Heald Hyd. Cap. 1940.
No. 81 Heald Plain Hyd. 1940.
No. 30 Heald Plain Hydraulic. 1941.

GRINDERS, SURFACE

No. 16A Blanchard Rotary. 1942.
No. 22 Heald Rotary, 12" Chuck. 1943.

GRINDERS, THREAD

No. 31 Excello Thread Grinder. 1941.

GUN BARREL MACHINES

No. ½Bx30 P & W Reamer. Latest.
No. ½Bx30 P & W Reamer. Latest.
No. ½B x 30 P & W Rifler. Latest.

LATHES, ENGINE

20"x20' Center LeBlond Heavy Duty. 1941.
22"x48" Monarch. 1942.
16"x27" Axelson. Late.

LATHES, PRODUCTION

No. 3FU Fastermatic Platen. 1942.
No. 3D Gisholt Simplimatic. 1939.
20"x25" Fay Automatic. 1942.
No. 12 Sundstrand Stub Lathe. 1942.
10"x12" LeBlond Multi-Cut. Late.
Lipe Carbo-Matic. 1942.
Lipe Mechanical Carbo. 1942.

LATHES, TURRET

1H5 Libby Universal. 1940.
No. 5 Gisholt Universal. 1942.
No. 4AR Libby Hand Carriage. 1942.
No. 3 Gisholt Universal. 1942.
No. 2 Warner & Swasey Simplified. 1941.

MILLS, PLAIN

No. 2L Cincinnati. 1941.

MILLS, PRODUCTION

No. 1224 Milwaukee Simplex. 1942.
No. 1-18 Cincinnati. 1942.
No. 0 Sundstrand Rigidmil. 1942.
No. 3A Sundstrand Copy Mill. 1942.
No. 1-8 Kent Owens. Late.

PRESSES

550 Ton Verson Double Action Toggle Press. 1940.

SHAPERS

24" Stockbridge. M.D.
36" Columbia. Late.

Write for latest stock list

INDIANAPOLIS Machinery & Supply Co.
1961 S. Meridian St. . . Indianapolis, Indiana

MUST MOVE PROMPTLY FROM LOCAL CUSTOMER'S PLANT

BEMENT MILES 18" SLOTTER with 3" dia. spindle. M.D.

GOULD & EBERHARD 36" Gear Cutter M.D.

BROWN & SHARPE #5—48" Gear Cutter, M.D.

BINSEE MACHINERY COMPANY HORIZONTAL BORING MILL. Table 30"x64". Quantity of boring bars.

CINCINNATI 60"x48"x14' Planer. 4 heads. 1 extra side head on massive floor stand for open side work. M.D.

B & O #2 Turret Lathe 1" Cap. M.D.

FOOTE-BURT #25—24" Heavy duty Vert. Drill #5 M.T. Motorized.

GRINDERS—CYLINDRICAL. B & S #11, 7"x 32". Plain Grinder. Table swivels. Motorized with 4 motors.

LANDIS 10"x36" Plain, M.D. Also Planer type Grinder 16"x36".

"BEMENT" 26" STROKE TRAVERSING HEAD SHAPER. 48" travel to ram. 2 tables. (PLANER SHAPER)

WE HAVE A LARGE STOCK FROM WHICH TO SELECT. TELL US WHAT YOU WANT.

THE OSBORNE & SEXTON MACHINERY CO.
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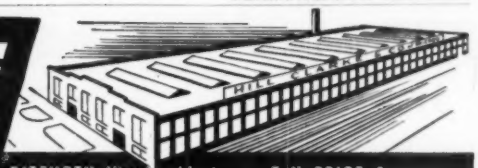
HILL-CLARKE MACHINERY COMPANY



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"PRODUCES ACCURATELY WITH MINIMUM MAINTENANCE" SAYS CARRIER CORPORATION of this 18"x120" Norton Cylindrical Grinder purchased from Hill-Clarke and used to grind bearing journals on fan shafts. And this kind of dependable performance with every machine has made Carrier a satisfied customer of Hill-Clarke for eleven years.

AUTOMATICS

⅞" G Model Gridley
1-1/16" Model A Cleveland (1942)
1½" Foote Burt (1941)
1¾" Model G 4 Spdl. Gridley

DRILLS

1 Spdl—15" SW—No. 2 Avey, Cam Fd.
2 Spdl—24" Sw—No. 2 Aveymatic
6 Spdl—14" Sw—No. 2 LMS L.G. Hyd.
D-31 Fox Multiple Drill

GEAR MACHINES

No. 12 HS Gould & Eberhardt Hobber
No. 12-H Gould & Eberhardt Hobber
11" Gleason Bevel Gear Generator
No. 6 Gleason Bevel Gear Tester ('42)
No. 64 Fellows Gear Shaper
No. 36-BM G & E 3 Spdl. Rougher
No. 65 Fellows—Cone Dr.

BORING MACHINES

3" Lucas Hor. Bor. Mill
Rockford—3⅛" Bar
72" Niles—Hvy. Pattern
72" Niles Vert. Bor. Mill — Hvy. Pattern

GRINDERS

4"x18" Landis, Model 4H
6"x18" Norton Type C Plain (1943)
6"x30" Norton Type C Plain (1943)
Hill-Clarke Norton Type Motor Driven Grinders
10"x36" centers
10"x50" centers
10"x72" centers
10"x96" centers
14"x36" centers
14"x72" centers
16"x120" centers
16"-40" gap x 120" centers
18"x96" centers
18"-30" Gap x 96" centers
20"x96" centers
24"-32" Gap x 144" centers
No. A-3—12" Arter Rotary Surf.
No. 25-A Heald Surface Grinder
5B Bryant Internal
No. 72-A-5 Heald Internal (1942)
No. 16-16 Bryant Internal Grd.
No. 16-28 Bryant Internal Grd.
No. 24-26 Bryant Internal Grd.
No. 81 Heald Centerless Internal
No. 74 Heald Internal Centerless

LATHES

14"x6' Walcott Lathe
19"x8' LeBlond Hvy. Duty Lathe
20"x9' Chard Lathe
36"x18' Putnam Grd. Hd., M.D.
No. 4 Warner & Swasey Tur.-Bar Fd.
No. 5 B & O Tur. Lathe, Cone Hd.
No. 6 Warner & Swasey Tur.-Bar Fd.
2¼"x24" Jones & Lamson
20"x8' Fay and Scott
18" Libby Tur. Lathe, M.D.
21" Gisholt, M.D.
No. 1 Acme 20½" Swing
No. 2 Acme 21" Swing
No. 2H Libby—8¼" Hole in Spdl.

MILLING MACHINES

No. 08 Cincinnati Vert.
No. 3 Sundstrand Rigidmil
6"x80" Pratt & Whitney Thrd. Mill
6"x132" Pratt & Whitney Thrd. Mill
6"x168" Pratt & Whitney Thrd. Mill
10"x48" Hanson-Whitney (1942)

MISCELLANEOUS

24" Milwaukee Shaper
15" Dill Slotter
18" Dill Slotter
38" Morton Draw-Cut Shaper (1945)
No. 0 Bakewell Tapper
No. 200 Micro. Horiz. Hone, 1 Spdl.
No. H-2 Micro. Horiz. Hone, 2 Spdl.
Model 200—H5 Micro.—Horiz.—2 Spdl.
14' Niles-Bement-Pond Roll
Am. Chip Wringers (New) 3.3 to 12.6 bushel capacity
No. 6 R & K Straight-side Press. M.D.
42"-16 Ga. Economy Shear, M.D.
4-B Marvel Hack Saw
No. 5 Reynolds Power Screw Driver
75 Ton Hannifin Hyd. 4 post press
No. 175 Geo. T. Schmidt Marking Mach.

PLANERS

36"x36"x12' Cincinnati, 2 hds.
36"x36"x12' Gray, 2 Hds.
42"x42"x10' Cincinnati 2 hds.
48"x36"x14' Gray, 2 hds.
48"x48"x12' Cincinnati; 2 hds.
48"x48"x12' Gray Maxi-Service
48"x60"x27' American, 4 hds.

FULL MONEY-BACK GUARANTEE

2. All machines in stock.
1. Hill-Clarke gives you an unconditional money-back guarantee.
3. You can see your machine run and tested under power in our plant before purchasing.
4. Complete and modern facilities plus experienced craftsmen for RE-MANUFACTURING machine tools in our 56,000 sq. ft. plant.
5. A responsible organization—with eighty-five years experience.

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IMMEDIATE DELIVERY
HARD TO FIND MACHINE TOOLS

No. 00, No. C, and No. 2 Brown & Sharpe Automatic Screw Machines and Turner Drives.

6½" RAC Acme Gridley Automatic Screw Machines, serials 40511, 40512 and 40257—late (3).

4½" Cleveland Model A Automatic Screw Machine, serial #34486.

1⅜" Model A Cleveland Automatic Screw Machine, late (2).

1-1/16" Model A Cleveland Automatic Screw Machine, late.

24" Bullard Vertical Turret Lathe, New Era.

No. 3A Warner & Swasey Saddle Type Turret Lathe, M.D.

No. 4A Warner & Swasey Saddle Type Turret Lathe, M.D.

No. 4 Warner & Swasey G.F.H. Universal Turret Lathe, M.D.

No. 3B Kearney & Trecker Double Overarm Plain Mill.

No. 3VG Read Prentice Vertical Mill, late.

No. 12 Brown & Sharpe Production Mill, late.

No. 14 Cochrane-Bly Universal Mill Shaper.

No. 2 Norton Tool & Cutter Grinder.

No. 2 Cincinnati Centerless Grinder, serial #2M2H1J-542.

No. 2 Cincinnati Centerless Grinder, serial #36A-13.

No. 3 Cincinnati Centerless Grinder, serial #3M3HIC-8.

16" Buffalo Geared Head Drill Press, late.

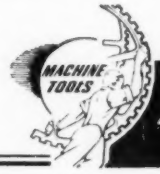
3" Gleason Bevel Gear Generator, late.

No. 12 Barber Colman long bed Gear Hobbers (9).

50 Ton Henry & Wright Dieing Machine, Peeves drive.

Agents for Cincinnati Lathes and Canedy-Otto Drill Presses

• **SCARCE MACHINE TOOLS.**



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BOLT THREADER, 1¼" Williams Reliance
BORING MILL, 108" Cinci. Massive, 2 Hds., M.D.
BORING MILL, 72" Gisholt, 2 hds., P.R.T.
BORING MILL, 72" N.B.P., P.R.T., M.D.
BORING MILLS, 4" bar P. & H. Floor, M.D.
BORING MILLS, 4" bar Landis Floor 41½" bar Niles table, Dual Control, 3" bar Lucas
DRILL, RADIAL, 6'16" vel. Amer. Trip. Purp.
DRILL, 25" Barnes Camel Back, 5 h.p. M.D.
DRILLS 21" Royersford-Excelsior New & Used
DRILL, 25" Weigel, Tapping, M.D.
DRILL, Spin. Allen, Pw. Fd., No. 2 M.T.
FACE GRINDER, 24" Bridgeport 32" wheel
GEAR HOBBER, 36M Gould & Eberhardt
GEAR HOBBER, #12 Barber Colman
GEAR PLANER, 14" Rienecker, Bevel
GEAR SHAPER, 6IA, 6I, & 64A, 6 Fellows
GRINDERS, 20"x120" Landis, Cyl., Hyd., AC
GRINDER, 16"x48" Cinci., Cyl., M.D.
GRINDER, No. 6-T Sellers, Tool, '42
GRINDER, No. 16Y28 Bryant, Int., 1943
GRINDER, Micro-Internal, Large
GRINDER, SURFACE, 14"x36" P. & W.
GRINDER, UNIV. 12"x36" Thompson M.D.
KEYSEATER, No. 5 Baker, capty. 4"x36", AC M.D.
LATHES, 42"x30' cen. Putnam Grd. Hd. M.D.
36"x20' cen. Putnam, 2 Carr. T.A.
32"x25' cen. Pitts. Sommerfeld, 2 carr. T.A., '42
30"x10' cen. LeBlond Cone
25"x12' cen. LeBlond Grd. Hd., M.D.
25"x12' bed Bridgeford Grd. Hd. (3)
24" 46"x13' bed Fay & Scott Gap, M.D.
25"x24' cen. Amer., T.A., new 1942
25"x24' cen. Lodge Shipley, T.A., '42
24"x14' cen. L. & S. T.A., M.D.
24"x16' bed American T.A. Grd. Hd
20"x10' cen. L. & S., T.A., M.D.
18"x10' bed L. & S., T.A., Cone Mtrzd.
18"x10' bed L. & S. Select Hd., T.A., M.D.
16"x16' & 12"x6' Hendeys Grd. Hd., T.A. (2)
16" 32"x8' bed Harrington Gap, M.D.
TURRET LA., No. 3AL Gisholt, 6¼" hole in spin. 26" Libbey "C" 4½" capty.
No. 1B Foster Univ., 2" capty. (2)
No. 2B Foster Univ., 3¼" capt. Bar, Timken #5 Gisholt, Air Chuck, '43
Denver-Acme 20" Univ., Air Chuck
WLWL Reid, 10"x22", 10 h.p., '42
THREAD MILLER, 12"x60" Morey Shields, '42
MILLER, No. 3 Cinci. Pl. Turner M.D.
MILLER, No. 4 Cinci. Univ., Hi Power, AC M.D.
MILLER, No. 3A B. & S. Univ. "Dual Control", Late, Vert., Rotary, Slot., Rack, etc.
MILLER, No. 3B K. & T. Pl., Dbl. Over, M.D.
MILLER, No. 0 Sundstrand Rigid-Mil Hand.
PIPE MACH., 8" Oster Rapiduction, Late.
PIPE THREADER, 2" Landis, AC, M.D.
SHAPERS, 32", 20" & 16" G. & E. Gear Box M.D.
SHAPER, 28" Columbia gear box, M.D.
SHAPER, 32" Cinci., Rapid Traverse, 1940.

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MacDell Availables in Late Type Guaranteed Machine Tools

Knight #40 Vertical Mill complete with Jig Boring Equipment, mfg. 1942.

Ohio Model P Production Mill, 36" Table Travel, mfg. 1943.

Brown & Sharpe No. 12 Automatic Mill, 18" Table Travel, mfg. 1943.

No. 3 Plan-O-Mill Form and Thread Milling Machine, mfg. 1943.

Heald No. 25A Rotary Surface Grinder, 24" Chuck, mfg. 1941.

Heald 72A3 Plain Internal Grinder with Red Head Spindle, mfg. 1942.

Cincinnati 10"x36" Cylindrical Grinder, Model ER, with Servo Hand Infeed, mfg. 1941.

Landis 4H 4" x 12" Plain Hydraulic Cylindrical Grinder, mfg. 1942.

Bardons & Oliver #2 Geared Electric Turret Lathe (2 available), mfg. 1942.

Cleveland 3¾" Model A Single Spindle Automatic with Tooling, Mfg. 1943.

Fellows Model 6IA Gear Shaper, mfg. 1941.

MacDell Corp.

1042 W. Lake St. Chicago 7, Ill.

TURRET LATHES

(2) Warner & Swasey Model #2M50 Capacity 1" Round Collet Hand Screw Machines, Chuckers. Serials #556, 154 and 556, 165 (1942)

(4) Warner & Swasey Models #2M70 Capacity 1" Round Collet Hand Screw Machines, Bar Feed Serials #555, 500, and 556, 200 (1942)

(3) Moreys Model #2G—Timken Capacity 1" Round Collet Power Feed to Turret, Bar Feed (1941-2)

(1) Libby (Gisholt) Model #3R—Ram Type Capacity 2" Round Collet Power to Turret, Bar Feed Serial #1044 (1942)

(1) Libby (Gisholt) Model #3R—Ram Type Hole in Spindle 2-3 16" Power to Turret, Chucker, 20" Swing Serial #1102 (1942)

OLDER MACHINES

(1) Libby 5", Bar Feed, Heavy Duty (1930)

(1) Foster #5, Bar Feed, 1-13 16" Collet Cap. (1930)

(1) W & S #4, Bar Feed, 1½" Cap., cone head

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SPECIAL OFFERING

Cincinnati No. 08 Vertical Milling Machine Serial No. 4F1V1J-248

Excellent Condition

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526 S. Alabama St., Indianapolis 25, Ind.

GUARANTEED MACHINE TOOLS

LATEST TYPES—1941-1951 MODELS

CAM MILLERS

VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

CUTTER & TOOL GRINDERS

FELLOWS: Flat Top Helical Gear Cutter Grinder
OLIVER: #2 Face Mill Cutter Grinder
G&L: #3 Tool and Cutter Grinder
GLEASON: #12 Cutter Sharpener
OLIVER: 10" Template Tool Bit Grinder
RANSOM: 2-Wheel Grinder 3 HP
RUSSELL: 40" Saw Sharpener (New), automatic indexing from tooth to tooth

DRILLING MACHINES

ALLEN: #2 High Speed, 15" overhang
PROVIDENCE ENG: FV-6 Sensitive 6 motor-driven spindles, ⅜" capacity, high speed type
PRATT & WHITNEY: ½B x 50 Deep Hole Reaming Machine

GEAR CUTTING MACHINES

BROWN & SHARPE: No. 6 Gear Cutter, 72" diameter, 1¾ D. P. capacity
FELLOWS: 61A Shaper, 18" dia.
FELLOWS: 64A Shaper, 18" dia.
FELLOWS: 72 Shaper, 7" dia.
FELLOWS: Straight Line Generator, 3" dia. with many cutters
GLEASON: #12 Rough & Finish Generator
GLEASON: 3" Straight Bevel Gear
SYKES: Gear Shaper 14" external, 20" internal (New)
SYKES: Rack Cutting Machine 12" to 36" length capacity (New)

GEAR AND SPLINE GRINDERS

PRATT & WHITNEY: 10" single and double wheel, hydraulic feed
GEAR GRIND MACH: GG-19, 10"x 24" Hydr. Spur Gears and Splines
GLEASON: No. 17 Spiral, Zerol & Hypoid, capacity 23½ P.D.

GEAR FINISHERS & TESTERS

FELLOWS: 8 LSI and 13 LSI Gear Lappers, external and internal spur and helical
FELLOWS: No. 12-C Spacing Tester
GLEASON: No. 4 and No. 6 Bevel Gear Testers, Hand and Power Operated
GLEASON: 3" Bevel Gear Tester
NATIONAL BROACH: SIC—12" Red King Tester

GRINDERS—CYLINDRICAL

BROWN & SHARPE No. 23, capacity 10"x48", plain
BROWN & SHARPE: No. 10 capacity 6"x18" plain
CINCINNATI, 6"x18" Hydraulic, plain
CINCINNATI, 10"x36" Hydraulic, plain
LANDIS: 18"x32" Type "D" Crankpin, Hydraulic, for grinding crankshafts
NORTON: 6"x18" plain, hydraulic

Grinders—Cylindrical—*Cont.*

NORTON: 10"x18" plain, hydraulic
NORTON: 10"x18" 45° angle wheel head
NORTON: Crankshaft Grinder, 23"x72"
VAN NORMAN: #666 Crankshaft Regrinder, 20"x48"

GRINDERS—GEAR & SPLINE

GEAR GRIND MACH.: GG-19, 10"x 24" Hydr. Spur Gears and Splines
GLEASON No. 17 Spiral, Zerol & Hypoid, capacity 23½ P.D.
PRATT & WHITNEY: 10" single and double wheel, hydraulic feed

GRINDERS—INTERNAL

BRYANT: #5 Internal
BRYANT: No. 5Y Internal
BRYANT: 112 Universal, Hydraulic
BRYANT: 16C16 Hole, Hydraulic
HEALD: 70A Plain, internal 7½" stroke x 9¼" dia. hole
HEALD: 72A5 Plain & Univ.
HEALD: 72A3 Sizematic Centerless
LANDIS: Hydraulic, 8" stroke x 15" dia.

GRINDERS—RADIUS

VAN NORMAN: #73, capacity 7½" diameter
VAN NORMAN: #639, capacity 7" diameter
VAN NORMAN: #649, capacity 6" to 16" diameter
VAN NORMAN: #3½ Universal, capacity up to 3½" dia.

GRINDERS—SURFACE

ARTER: A-1—8" Rotary
HEALD: 8" Rotary
HEALD: No. 22 Rotary—12" Chuck

GRINDERS—THREAD

EXCELLO: #31 External, dia. 5"x18" centers

HONING MACHINES

BARNES: No. 306H Vertical, 24" Stroke
MICROMATIC: H-510 Double End Horizontal, ¾" to 2" diameter capacity
MICROMATIC: H-2 Single End Horizontal, 2-spindle, ¼" to 1" dia. capacity

LAPPING MACHINES

FELLOWS: 8 LSI and 13 LSI Gear Lappers, external and internal spur and helical
NORTON: No. 26 Hyprolaps, for flat work & cylindrical lapping
NORTON: 2Fx40" dia., for flat work

LATHES—PRODUCTION

BLOUNT: Poilshing speed lathe 12" dia. x 48": centers
HENDEY: 16"x54" Toolroom
LODGE & SHIPLEY: #3A Duomatic, 25½" swing x 27" centers

Lathes—Production—*Cont.*

WILLSON: 15" x 48" Geared Head Motor Driven (New)

LATHES—TURRET

HERBERT: Turret Lathes, all sizes (New)
WEBSTER & BENNETT: Vertical Turret Lathes, 36" and 48" dia. (New)

MILLING MACHINES

CINCINNATI: 2-spindle Vertical Hydrotel with two rotary tables of 36" dia.
CINCINNATI: #0-8 Vertical Millers, Automatic Type
KENT-OWENS: #1-8 Hydraulic Plain Miller
RICE-BARTON: Duplex Spline
SUNDSTRAND: No. 0 Rigidmil
TAYLOR-FENN: Vertical 6x21" table with power feed, high speeds
TAYLOR-FENN: M-80 Duplex Spline
VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

SAWS & CUT-OFF MACHINES

CAMPBELL: No. 425 Cutalator Abrasive Cut-Off, 4½" dia. capacity
MOTCH & MERRYWEATHER: No. 3 Circular Saw with auto. stock feed
RUSSELL: 9½" cut-off Saw with Auto. Stock Feed (New) Hydraulic
WILLIAMS: 10" Pipe & Tube Cut-Off

THREAD MILLERS & TAPPERS

HALL PLANETARY: Model "D" Thread
LEES-BRADNER: LT 6"x36" Thread
LEES-BRADNER: 40A Thread Miller
MURCHEY: #22 Horizontal threading and tapping machine, ⅛" to 2½" dia. capacity
NATCO: Vertical Tapper 16 spindle
PRODUCTO: Hand Tapper

TOOL SHARPENERS

FELLOWS: Flat Top Helical Gear Cutter Grinder
OLIVER: #2 Face Mill Cutter Grinder
G&L: #3 Tool and Cutter Grinder
GLEASON: #12 Cutter Sharpener
OLIVER: 10" Template Tool Bit Grinder
RANSOM: 2-Wheel Grinder 3 HP
RUSSELL: 40" Saw Sharpener (New), automatic indexing from tooth to tooth

MISCELLANEOUS

RUSSELL: 9½" cut-off Saw with Auto. Stock Feed (New) Hydraulic
CUT-OFF: Campbell, abrasive 425 Cutalator 4½" dia. Capacity
RACK CUTTING MACHINE: Sykes 12" to 36" length capacity (New)
CUT-OFF: Pipe & Tube, 10" Williams
PRESS: Screw. Gen. Flex. 3 ton
RIVETER: Gen. Engr. 24" throat
TEST STAND: Denison 918-AM Hyd.
LATHES: Blount Polishing Speed Lathe, 12" dia. x 48" centers
PUNCH SHAPER: Sentinel Shrewbury, Thiel type design (New)

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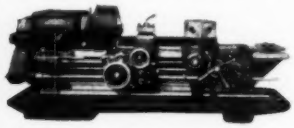
HEADLINERS

GRINDERS
14" PRATT & WHITNEY Model B Vert. Spindle Surf.
20"x144" Landis Plain Cylindrical, self-cont.
No. 49-53 Besly Vert. Spdle Disc, m.d.
No. 2 Norton Motor Driven Tool & Cutter

TURRET LATHES
No. 3-A Warner & Swasey, m.d., bar feed
No. 3-L Gisholt Heavy Duty, m.d.
4"x34" Jones & Lamson "Hartness", clean



No. 3-L Gisholt Heavy Duty Turret Lathe

MILLERS
No. 00 Sundstrand Hydraulic "Rigidmil", m.d., late
No. 1-V Kent-Owens Hydraulic, m.d., late
48" Cincinnati Plain Automatic, m.d.
No. 2 Cincinnati High Power Plain, m.d.
No. 2 Kempsmith Universal, motorized
No. 2-B Hvy Brown & Sharpe Plain, arr. m.d.
No. 2-B Milwaukee DOA Universal, spd
No. 3-A Brown & Sharpe Universal, m.d.
No. 4-B Hvy Brown & Sharpe Plain, arr. m.d.
32"x24"x16' Ingersoll Adj. Rail, arr. m.d.

LATHES
30"x132" centers American Hvy Pat 12-speed Grd. Hd., m.d., taper
24"x60" ctrs. American Heavy Pattern 12-speed Grd. Hd., m.d., taper
24"x51" ctrs Lodge & Shipley 12-speed Selec. Grd. Hd., m.d., taper
21"x136" ctrs LeBlond Heavy Duty, Turner Drive, taper
20"x96" ctrs Lodge & Shipley 12-speed Selec. Grd. Hd., m.d., taper
20"x94" ctrs American Grd. Hd., m.d.
20"x70" ctrs Lodge & Shipley 12-speed Selec. Grd. Hd., m.d.
16"x30" ctrs Lodge & Shipley 12-speed Selec. Grd. Hd., m.d.
14"x30" ctrs Lodge & Shipley 12-speed Selec. Grd. Hd., m.d.
11"x4' LeBlond "Rapid Production" High Speed Grd. Hd., m.d.
W. C. Lipe "Carbo-Lathe", m.d., late

PLANERS
36"x36"x16' Cincinnati, 2 heads
36"x36"x18' Gray, 2 heads
42"x42"x14' Niles-Bement-Pond, 4 heads
42"x42"x16' Gray, 2 heads
48"x48"x12' Niles-Bement-Pond, 4 heads

MISCELLANEOUS
No. 17 Gleason Hypoid Bevel Gear Tester late
18" Gleason Str. Tooth Bevel Gear Generator
No. 7 Fellows High Speed Gear Shaper
Class "F" Bertsch Punch & Shear, 1¼" thru 1", 48" gap
32" Gould & Eberhardt Shaper, gearbox
No. 77 Toledo Open Back Press
18" Niles-Bement-Pond Slotter

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#2-36 CINCINNATI Vertical—Hydr.
10-48 AMERICAN Type H—Horiz.—Hydr.

DRILLS, MULTIPLE
Kingsbury 7 Station 80" Auto. Index
2—3—4 Spindle ATLAS

GEAR SHAPER
#7125 FELLOWS High Speed
#715 FELLOWS High Speed

GRINDERS INTERNAL
#5 BRYANT Precision
#16—16 Bryant
#72A5 HEALD—Hydr.—Plain

GRINDERS BROACH
6x48 THOMPSON Auto.

LATHES
18"x10" LODGE & SHIPLEY—12 Speed—G.H.
20"x115" cc HENDEY 9 speed G.H.
36"x84" cc BRIDGEFORD G.H.

MILLERS, PRODUCTION, SIMPLEX
M-18 CINCINNATI knee Type
#3-24 CINCINNATI Hydromatic

MILLERS, THREAD
#40 LEES BRADNER Production

PLANERS
36x36x10 FLATHER—Older
48x48x12 WOODWARD—Older

PRESSES, O.B.I.
9 ton DIAMOND—M.D.
12 ton U.S.—M.D.
14 ton DIAMOND

PROFILERS
MOREY 12-M Vertical—2 spindle

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MACHINERY VALUES

PRESSES
Niagara No. 13 Plain Horn Press
McDonald No. 31 O.B.I. Press
Bliss No. 52 Straight Side Single Crank Single Geared Press
No. 162 Bliss Straight Side Gap Frame Dial Feed Cartridge Press (2)
No. 59 Niagara Straight Side Single Crank Press—150 Ton
No. 24 Bliss Knuckle Joint Press, Cap. 400 Tons
No. 79 Toledo Press—Gap Bed—Horn Type, Cap 161 Tons

FORGING MACHINES
No. 10 Buffalo Armor Plate Bar Shear
2000 lb. Steam Drop Hammer
1500 lb. Steam Drop Hammer
1½" Acme Upsetting & Forging Machine
Cleveland Model Z Single End Punch and Shear
3000 lb. Chambersburg Board Drop Hammer
5" Acme Upsetting and Forging Machine
#2 Hilles & Jones Bar Shear, Cap. 2½" RD
Motch & Merryweather #3 Metal Saw, Latest Model

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LATEST TYPE

Cincinnati Hypro Hyd. 36"x36"x12' Planer, 3 Heads (1950)

J & L No. TG-1245 Thread Grinder

Monarch 33½"x120" cc G.H. Engine Lathe, Pan Bed (1947)

L & S 24"x192" cc G.H. Engine Lathe, Pan Bed

American 27"x96" cc G.H. Engine Lathe, Pan Bed

Gleason 12" Bevel Gear Finisher

Pratt & Whitney Keller Type "G"

Norton 6"x30" Cyl. Grinder, Hydr. Table & Head Traverse

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GRINDERS
No. 24A2 Hanchett Two Spindle Vertical Thru-Pass Rotary Surface Grinder.
New 1945 — Very Good Condition

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NEW & USED—COMPLETE LINE OF
Box Brakes, Press Brakes, Notchers, Shears, Punches, Rolls, Spot Welders—Di-Acro, Pexto, Whitney Equipment, etc.
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SOME LATE MACHINES STILL AVAILABLE

BORING MILLS

Bullard 24" VTL New Era
Cleveland 2½" Bar Cap.
Giddings & Lewis No. 0, 3" cap.
Giddings & Lewis No. 32, 3⅛" cap.
King 42", 72" Vert. 2 rail heads
Niles-Bement Pond 4" Bar
Niles-Bement-Pond 4½" Bar
Niles-Bement-Pond 60" Vert.

DRILLS AND RADIALS

Bausch Multi-spindle
American 6'x15" Univ.
Buffalo #2 Motor Spindle
Cincinnati Bickford 6'x13" col.
Walker-Turner Radial, 2½'
Natco #12 20 spindle drill
24" Sibley Sliding head

ENGRAVERS

Auto Engravers Bench Type
Deckel Type GK2 3 Dimensional, New
Gorton #1A, ME
Gorton #3B 3 Dimensional
Gorton #3Z 2 dimensional

GEAR EQUIPMENT

Barber-Colman #2
Barber-Colman #12 Hobber (3)
Fellows High Speed Shapers 712, 725, 71
Flather 72" Cutter
Gleason 3" Straight Bevel Generator
Gleason #4 Angular Bevel Tester
Gleason #2 Surface Hardener
Gould & Eberhardt 36" Cutter
National Broach Red Ring Lapper, Shaver
Schuchardt & Shutte #1 Hobber
Fellows #20M Redliner

GRINDERS, MISCELLANEOUS

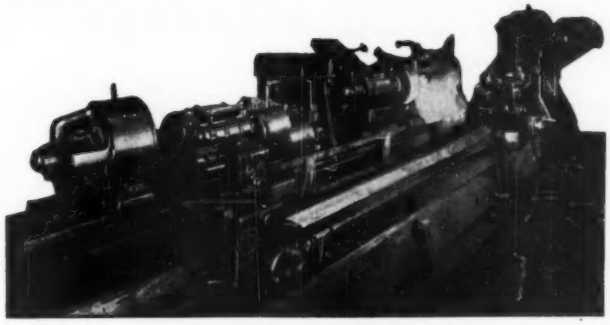
Bryant #5 Internal, chucking
Grenby Int. 1G-12, G2
Heald #73 Internal centerless
Heald #81 Internal Gagematic
Heald 72A3 Int. Centerless Sizematic, #1 Tool
Landis 6"x30" Type C Cyl.
Majestic Internal
Norton Type C 6"x18" Semi-Automatic cyl.
Norton 6"x30", 10"x18" Type C cyl.
Norton 14"x96" cyl.
Norton Roll Grinder 50"x28'
Oliver #510 Drill Pointer
Pratt & Whitney Radius #R6, K.O. Lee Tool
Sellers 6T Tool
Van Norman #666 Crankshaft
Wicaco Internal

GRINDERS, SURFACE

Abrasive 8x24", #33 Vert. & #34
#10 Blanchard 16" Chuck
Blanchard #16, 30" Mag. Chuck
Brown & Sharpe #2 Mag. Chuck
G & L Hyd. Feed #5, 10"x36"
Heald 22—12" chuck, Arter 12"
Pratt & Whitney 12x36" Vert.
Reid 11x36 Motor in Base

LATHES

Bertram 28"x22' CC, Late
Bridgeford 36"x20', 32"x16'
Lodge & Shipley #3 Duomatics
Hardinge Precision 9", 1" Collet Cap., Rivett
Hendey 12"x54" and 12x30", 1941



Norton Roll Grinder 50" x 28' (actual photo)

Hendey 14" Yoke Head Lathes
LeBlond Regal 10"x3' bed
Lipe-Carbo 12"x18" (2)
Monarch 22x120" cc NEW
Putnam 42"x17'
Sebastian 12"x4' G.H.
Wickes 32"x35' Geared Head
Reid Small Piece #9WSL
Sundstrand 8x15"
Sundstrand 15" Stub
Prompt Delivery NEW 16 and 20" Lathe

MILLS, PLAIN, UNIVERSAL PROD.

Archdale Plain, 14", Prod.
Brown & Sharpe #3B Plain. Late
Brown & Sharpe #21
Burke #4 Plain & Univ.
Cinn. 08 Plain
Cinn. No. 3, 4 Plain Spd.
Kent Owens 1V
Milwaukee #2B, Plain & Univ
Simmons Micro-Mill #1A
Van Norman #2 Universal
NEW Universal Mills. Prompt Delivery

MILLS, VERTICAL

Brown & Sharpe #3 single pulley drive
Cincinnati #3, #4 hi-power
Cincinnati 08 Vertical
Morey #12M Profiler, 2 sp.
Pratt & Whitney Profiler 12B, 2 sp.
NEW Swivel Head type. Prompt Delivery

PRESSES

Bliss 645, 650 Hi-Production Presses
Bliss 18, 21, OBI, 58, 62, 162, OB.
Bliss 4½ Double Action, Roll Feeds, Cam (2)
Bliss #781½, 330 Ton, SS, Bliss 741½
Niagara Horning, 15 Ton
Niagara A1¾, O.B.I.
Toledo 29 Double Action Cam
V. & O. #102 O.B.I. Reducing
Walsh No. 3 O.B.I. 23 Ton
Zeh & Hanneman, 40 Ton O.B.I.

TURRET LATHES

Acme 6W Fox 2-9/16" Cap.
Bardons & Oliver #2 Late, #3
Brown & Sharpe, #1, 2 Hand, #10, 11
Denver, 6 2" Shell Turret (2)
Foster #2B 2½" Cap.
Gisholt #4 bar feed, Late
Gisholt #2L Cross Sliding Turret, & 1L
Morey #2G Late
Oster 601WD. #2 Simmons Microspeed
Warner & Swasey #1A, 2A Timken Head
Warner & Swasey #4 Universal

MISCELLANEOUS

Automatic, Cleveland Model B 1-1 16"
Automatic B & S #00G
Automatic 4 Sp. 11½ Conomatic

HYDRAULIC EQUIPMENT

SELF CONTAINED PRESSES

500 Ton Shaft Straightener 24' Long Bed. Watson Stillman
125 Ton Southwark Press, Bed 96"x30". 30" stroke, 2 to 4 ft. opening
50 Ton William & White Gap Press, 20" St. 54"x20" Bed—24" opening
600 Ton William & White Up-Moving Ram 42"x60" platen 12" str., 24" opening self-contained

MISCELLANEOUS PRESSES

300 Ton Watson Stillman 24x20" Platen 11" St. 21" opening

All Hydraulic Equipment is completely engineered and checked by a competent staff, thus assuring reliability. Send us your Hydraulic problems.

NEW IN STOCK

Air Hydraulic Presses — Arbor Presses #6C Famco — Band Saws Kalamazoo — Famco 6x12"—Drill Presses all sizes—Hydraulic Press Northern 20 Ton — Injection Molders, 1 ounce — Power Presses, OBI, 1, 4, 4½, 5, 7½, 10, 15, 20, 30 ton—Shaper 7" Amco, 8" Shaperite —Shaper Sheldon 12" — Shears, Foot 22" to 8', 16 & 18 ga.—Shears, Power 3'x18 gauge to 10' x 10 ga.—Welders, Arc, Seam, Spot all sizes—Vert. Milling Attach. Halco H.S. Motors, Grinders, Buffers, all sizes.

Band Saw: DoAll Zephyr 36"
Band Saw: #8 Marvel
Filers—Grob Band Filer
Hacksaw: Peerless 6"x6"
Hacksaw: #6A Marvel 6x6 tap
Hacksaw: Racine 10x10" Hyd.
Honer: Micromatic #H-1
Keyseater: Davis, Baker, M & M
Shapers: 24" Rockford, 24" Cinci., 28" Gould & Eberhardt. Many Others
Shears Power: George Ohl 10' 3 16", 10' x 16 gauge, 11' 16 gauge
Tappers: #3C Haskins
Welder: 50 KVA Eisler Air Operated
Welder: Taylor-Winfield 50 KVA Hi-Wave

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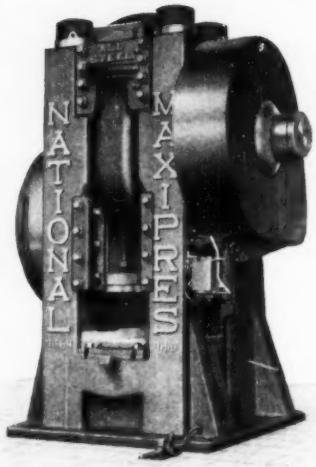
NATIONAL MAXIPRES



NATIONAL No. 2 MOTOR DRIVEN ALL STEEL-COINING MAXIPRES.
Capacity 500 Ton — Stroke 6"
Area of Bed L to R 20" — F to B 34"
1934 Machine — with 15 H.P. Motor

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FINE LATE TYPE GUARANTEED TOOLS

60"x20' **NILES BEMENT POND** Geared Head Engine Lathe, rapid traverse

56"x18' **CMC** Heavy Duty Lathe, 24 speed geared head, power rapid traverse, 30 HP AC motor

24"x10' centers **LODGE & SHIPLEY** 12 Speed Geared Head Engine Lathe, Taper Attachment

20"/40"x12' **NEBEL** Series AG Sliding Bed Gap Lathe, new 1943

14"x66" centers **HENDEY** No. 3 Manufacturing Lathe, new 1937

No. 9 **LeBLOND** Multi-Cut Production Lathe

No. 2B **FOSTER** Turret Lathe, 3¼" bar capacity

100" **BERTRAM** (Niles Patterns) Vertical Boring Mill, 2 heads on rail, rapid traverse, new 1932

42" **BULLARD** New Era Type Vertical Turret Lathe, AC—MD

42" **BULLARD** New Era Type Vertical Turret Lathe, side head, motor drive

No. 6C **POTTER & JOHNSON** Semi-Automatic Chucking Machine, air chuck

No. 1 **DOUGLAS** Plain Horizontal Mill, table 8"x32", power feeds, motor in base, No. 40 taper, new 1942

No. 2B **KEARNEY & TRECKER** Plain Horizontal Mill, AC—MD

No. 2B **KEARNEY & TRECKER** Vertical Mill, motor in base, rapid traverse

No. 4B **KEARNEY & TRECKER** Plain Horizontal Mill, motor in base, rapid traverse, vertical head

25A **HEALD** Rotary Surface Grinder, 24" diameter, magnetic chuck

No. 72A5 **HEALD** Sizematic Internal Grinder

14"x18" **MATTISON** Hydraulic Surface Grinder, new 1939 (April delivery)

No. 5 **HILLES & JONES** Pyramid Type Plate Bending Rolls, 14" diameter top roll, 12" diameter bottom roll, 10' long, drop end housing, 30 HP slip ring motors

No. 60 **NEW BRITAIN** 1"—6 Spindle Automatic Screw Machine, new 1943

No. 36H **GOULD & EBERHARDT** Automatic Gear Hobber

36"x36"x10' **G.A. GRAY** Maxi-Service Planer

75 Ton **HENRY & WRIGHT** Dieing Machine

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Heald No. 25A Rotary Surface Grinder, 24" magnetic chuck (1941), light tool room use
Gallmeyer & Livingston No. 3V Hydraulic Surface Grinder 8" x 24" capacity, new chuck
PELS No. MK10 Universal Ironworker 3" x 3" x ⅜" drive
24" x 24" x 6' Liberty Planer, box table, D.C. drive
BERTSCH 36" Gap Punch, 1" thru 1¼" cap., motor drive
H-2 Micromatic Hydrohone, (1943)
16" x 108" South Bend Toolroom Lathe, (1942)
No. 3A WARNER & SWASEY Universal Turret; Bar Feed; Collets; Tooling; Serial Number 212000 Motor Drive
30" YAETES Heavy Duty Band Saw, (1943)
No. 18 WILLIAMS & WHITE Punch Motor Drive

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21-30	5⅛	.80
31-40	4⅝	.70
41-50	4⅛	.60
51-60	3⅝	.50

⅛" to ½" H.S. 12" long S.S. Drills; 17.32" to 31.32" H.S. 15" long T.S. Drills; 1" to 1½" H.S. 20" long T.S. Drills also available.

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MODERN MACHINES

#40 Landis Floor Type Horizontal Boring Mill
6D Potter & Johnson Automatic Chucking Machine
#35 Excello Thread Grinder
#6A Fellows Gear Shaper
#30 Waterbury Farrell Thread Rollers
#0 Brown & Sharpe Automatic Screw Machines with Turner Drives
#3 Barber Colman Hobbing Machine
Gi-A Acme Gridley 1½ Automatic Screw Machine
16" Gould & Eberhardt Shaper
6 Spindle Allen Drill

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OUTSTANDING MACHINE TOOLS

BORING MILLS—Horizontal
FRANKLIN 4¾" Bar; table type; M.D.
GIDDINGS & LEWIS #25 R.T.; 2½" bar; M.D.; Late
LANDIS #40, 4" Bar; floor type; M.D.
LANDIS #35 floor type; 3½" bar; M.D.
NILES 8" bar floor type, motor drive

BORING MILLS—Vertical
BETTS 120" 2 heads P.R.T.; M.D.
BULLARD 8", 16" 6-spdle, "A" Mult-au-matic
COLBURN 72"; power rapid traverse; M.D.
NILES 53"; motor drive (heavy)

BROACHES
CINCINNATI 1-30 Duplex Vert. Hydr.
LaPOINTE S.R.V. 15-ron 48" Stroke, Late

DRILLS—Radial
CINCINNATI BICKFORD 6'15" Univ.; M.D.

DRILLS—Miscellaneous
BARNES No. 429 Deep Hole; late
BARNES H-3 Hydram; hydr.; inverted; late
BARNES H-2 Hydram; hydr.; M.D.
BARNES 20" 4-spindle Camel Back; Late
BARNES 24" all geared; Camel Back; M.D.
BODINE #42-20 multi-univ., dial feed; M.D.
MOLINE 6-spindle Hole-Hog 3⅜"; M.D.
NATCO No. 14 Mult.; Rect. Hd.; PRT; M.D.

GEAR CUTTING EQUIPMENT
BILGRAM 6" & 16" Bevel Gear Cutter, M.D.
BROWN & SHARPE 6-72" Auto. Cutter; M.D.
CROSS #1, #40, #45 Tooth Rounders; M.D.
FELLOWS No. 4 Enveloping Gear Gen., M.D.
FELLOWS Nos. 61A, 6Z2, 715, 75, 7, 7A, 75, 72, 77 High Speed Gear Shapers; late
FELLOWS 13-LS Lapper; late
GLEASON 3" & 12" Straight Bevel Gen.; late
GLEASON #4 & #6 Tester, Late Type
GLEASON 10", 11" & 18" Bevel Gear gen.
GLEASON 24", 37", 77", 96" Bevel Gear Planers; M.D.
GLEASON No. 14 Hypoid Grinder; late
PRATT & WHITNEY 10" Gear Grinder; late
SYKES #4A, #8A gear generator; M.D.

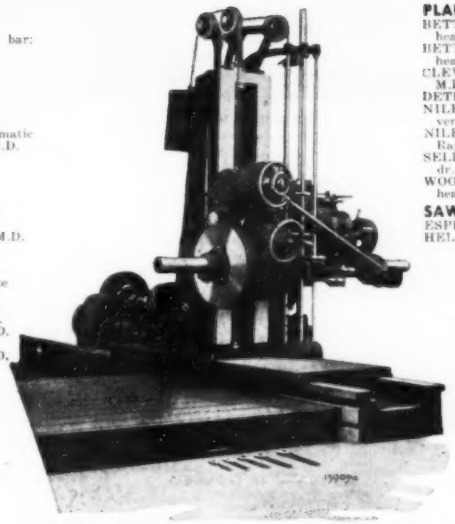
GEAR HOBBERS
BARBER COLMAN #12 dble. overarm; M.D.
GOULD & EBERHARDT #24H. Late.
GOULD & EBERHARDT #36H. Late.
GOULD & EBERHARDT #36BM 3 spindle Auto. Rougher; M.D.
KOEFFER WM-1 Auto.; bench type; Late
PFAUTER R81; max. dia. 30"; late

GRINDERS—Plain Cyl. & Univ.
CINCINNATI 6x18 cyl. Pl. Md.
CINCINNATI 14x72 Model ER Plain, Late
CINCINNATI Mod EA 6x18 Pl. Cyl. Hydr.; M.D.
LANDIS 10x36, 16x36 C Pl., Hyd., Late
LANDIS 6x18" Type C Plain; Hydr.; late
LANDIS 30" x 240" Plain cyl., M.D.
NORTON 17x42" crankpin; Hydr. Dbl bd.; M.D.

GRINDERS—Surface
BROWN & SHARPE No. 5; motor drive
BILLITTER & KLUNZ 48x196" Way Grinder
PRATT & WHITNEY 14x36" Model B, Late
TAFT PIERCE 6" Rotary, M.D.

GRINDERS—Misc.
BRYANT No. 3, 5, 16-C-16, 16-CP-16, 24 Intl. Hydr.; Late
EXCELLO #48 Carbide
HEALD No. 81 "Sizematic"; Late
HEALD No. 72-A-3 "Gagematic" Int.; Late
HEALD No. 72-A-3 "Gagematic" Int.; Late
HEALD No. 78 Internal Centerless; M.D.
LEMPCO 22x72" Mod. KG Crankshaft; Late
VAN NORMAN 666 Crankshaft Regrind
VAN NORMAN 639 Osc. type Radius; Late

LATHES—Engine & Mfg.
AMERICAN 36"x360" centers; 2 carriages
AMERICAN 36"x33" centers geared heavy
GLEASON No. 12 Tool Sharpener; late



NILES-BEMENT-POND 8" model HM 8 Floor Type Horizontal Boring, Milling & Drilling Machine—Head Section Only—

JONES & LAMSON "FAY" 20x25" Automatic; M.D., Late
LEHMANN 25x96" center; Timken; grd M.D.
LeBLOND 16x36" center; Auto.; Timken; late
LeBLOND Mod. 7ACL Crankshaft; M.D.
LODGE & SHIPLEY 24"x96" centers; Late
LODGE & SHIPLEY No. 5—24" and 96" centers DUOMATIC; Timken; Late
LoSWING 4x60", 8x24", 8x108"; late
MONARCH 22"x456" centers "CM" Precision; helical geared; TIMKEN; M.D.
NILES 30"x50" Boring "Time-Saver"; Timken; Late
NILES 48"x32" centers Engine; geared; M.D.
PORTER McLEOD 16"x8' geared, 12 speed QCG; NEW
REED PRENTICE 16"x24" centers grd; M.D.
SPRINGFIELD 14"x43", geared; M.D.
SUNDSTRAND 10x60" Auto. Center drive

LATHES—TURRET
MOREY No. 2 ram type TIMKEN
GISHOLT 1L Saddle type, M.D.
WARNER & SWASEY No. 5 Univ. Bar; M.D.

MILLING MACHINES—Plain
CINCINNATI 4-48, 4 spindle, Tracer; Late
CINCINNATI No. 3 Plain; rectangular; M.D.
SUNDSTRAND No. 3 Rigidmill, TIMKEN

MILLING MACHINES—MFG.
GOULD & EBERHARDT 25 Cont. type; M.D.
INGERSOLL 32x24x16' Planer Type; 2 hds.
INGERSOLL 30x24x12' Adj. Rail Slab; M.D.
SUNDSTRAND Mod 3A Duplex 42" feed M.D.
TAYLOR & FENN M-80 Duplex Spline; Late

MILLING MACHINES—Vertical
CINCINNATI 0-8 Mod EA Auto. PRT; Late

MILLING MACHINES—Thread
HALL Style D Planetary; Late Type
LEES BRADNER HT 12", 54", M.D.; Late
LEES BRADNER HT 12x36" M.D.; Late
MOREY 12x30", 12x60" centers; late
PRATT & WHITNEY 4½x12 Mod. C; late
PRATT & WHITNEY 6x132; M.D.

PLANERS
BETTS CONSOLIDATED 84" x 92" x 16' 4 heads PRT Box Table; DC Reversing M.D.
BETTS CONSOLIDATED 108" x 84" x 44' 4 heads; PRT; Box Table; M.D.
CLEVELAND 48"x48"x12' Openside; AC; M.D.
DETRICK & HARVEY 48"x48"x16' hydr.
NILES 108"x84"x42' 4 heads; Rapid Traverse; Box Table DC; M.D.
NILES-BEMENT-POND 72"x72"x30' 4 hds.; Rapid Traverse; M.D.
SELLERS 60"x60"x12' 4 heads vari-voltage dr.; PRT
WOODWARD & POWELL 54"x54"x20'; 4 heads; M.D.

SAWS
ESPEN LUCAS No. 679 30' cap Hydr.; Late
HELLER Model SS-1, 6¾ Cap Cold Saw

SHAPERS—SLOTTERS
CINCINNATI 16", Heavy; PRT; Late
DILL 18" Slotter; motor drive
PRATT & WHITNEY 6" Vertical; M.D.
PRATT & WHITNEY Model M-1251, 10" Vertical
PRATT & WHITNEY 10" Vertical Slotter
LYND FARQUHAR 26" Openside; M.D.
NEWTON 15" Slotter; M.D.
ROCKFORD 20" vertical, Hydr.; Late

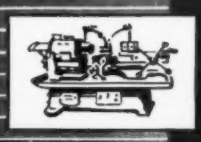
PRESSES
BESCO Mod. 21 Incl. 40 ton, 3" stroke NEW
PIRDSBORO 225 ton Vert Hydr; Late
BLISS No. 410A Toggle Drawing; tie rod; steel gearing
BLISS No. 3½A geared toggle; dble. acting

STOCK DELIVERY
No priorities required

CHAMBERSBURG Straightening 24"; M.D.
GLEASON 15" Quenching; hydr.; M.D.
NATIONAL #5 Maxi-Press; tie rod (Forging); M.D.
NATIONAL #5 H.S. Maxi-press (Forging)
NIAGARA No. 512 DG tie rod; 282 tons; M.D.
UNITED ENG. 500 ton hydr. forging
WATERBURY Farrel 125 Ton; St. Side

MISCELLANEOUS
AJAX 3½" forging, upsetting; M.D.
BAKER #5 Keyseater; motor drive
BARNES No. 172, 214 Honing; hydr.; Late
CROSS #45 Tooth Gear Chamfering Machine
DeLAVAL No. 194 Coolant Clarifier; Late
FISCHER No. 1, No. 2 Oil Grooverr; Late
GROB OS-20 Metal Band Saw—Filer; M.D.
GYROMATIC Model 40 1⅝" 6 Spindle, Late
LANDIS 2" sgle. Dble. Spdle. Threaders; M.D.
LeBLOND #2 Barrel Lapper; M.D.; Late
MANVILLE 2C Auto Screw Slotter; M.D.
MANVILLE No. 2 Slotters; Late
MANVILLE No. 3 Trimmers; Late
MANVILLE No. 2 SSOD Readher; M.D.
MANVILLE 1A DSSD Heater; M.D.
MANVILLE No. 3 Rehsaders; Late
MANVILLE No. 3C Thread Roller; M.D.
NORTON 2F, Vertical Lapper; M.D. Late
SAUNDERS 8-18" Pipe Machine; M.D.
US TOOL 810-B Cutter Reliever; Late
WATERBURY FARREL No. 11 Thread Roller 1PGBO""

Available for Prompt Shipment ***Send for Latest Catalog*** ***Most Built After 1941***



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PARTIAL LIST OF LATHES

Bradford 20"x18' bed, 4 SCD, 12' center distance, Loose change, taper attachment.
American 20"x12' bed, 8 spindle speeds, 70" center distance, taper attachment.
Blount Model 83 Lathe for Turning, chucking, polishing and lapping, 20" swing, 8' bed.
American 48"x20' bed, Internal Face Plate Drive, 10' center distance, 2⅝" hole in spindle.
American 36"x40' bed, Internal Face Plate Drive, 33' center distance, 2⅝" hole in spindle.
Schumacher & Boye 36x24' bed, Internal Face Plate Drive, 15' center distance, Turner Gear Box
Lodge & Shipley 24"x12' bed, 5 SCD, taper.
LeBlond 24"x10' bed, 3 SCD.
LeBlond 21"x10' bed, 3 SCD.
Lodge & Shipley 20"x8' bed, 12 spindle speeds.
Monarch 20"x6' bed, 8 speed head, drop lever handles.
Lodge & Shipley 18"x9' bed, Bowl head, 3 SCD.
American 18"x8' bed, Bowl head, 3 SCD.
Lodge & Shipley 16"x6' bed, 12 spindle speeds.
Monarch 16"x6' bed, 3 SCD.
American 16"x8' bed, bowl head, 3 SCD.
Lodge & Shipley 16"x6' bed, 12 spindle speeds.
Hendey 14"x6' bed, Yoke head, 4 SCD.
Monarch 14"x6' bed, 3 SCD.

BORING MILLS—VERTICAL

Colburn 54", 2 heads on rail.
King 42", 2 heads.

GEAR MACHINERY

Brown & Sharpe 3-28, with flywheel on cutter.
Gould & Eberhardt 18H Hobber.
Gould & Eberhardt 96H Hobber.

GRINDERS, CUTTER

Sellers, 4T, motor driven, late type.
Sellers, 6T, motor driven, late type.

GRINDERS, DISC

U. S. Model 80, Double end, 7½ HP.
Gardner 24-53", vertical spindle.

GRINDERS—UNIVERSAL

Brown & Sharpe #1.

GRINDERS, INTERNAL

Heald #78 Centerless, Internal & Cylindrical late type.
Micro, Model FG., new 1932.
Heald #70, new 1941.
Landis Thread Grinder, #6, new 1944.
Heald #50.

HAMMERS

Nazel 6N, 40 HP motor.

MILLERS—AUTO. & PRODUCTION

Cincinnati 2-24 Plain Automatic.
Cincinnati 1-18 Plain Automatic.
Ohio 40" Tilted Rotary.

MILLERS—PLAIN OR UNIV.

Ohio #3 Plain, Rect. overarm.
LeBlond #2½ Univ. Round overarm.

PLANERS

Liberty Planer 36x36x18' Double housing.
Cincinnati 24x24x6', belt drive.
Gray 24x24x6', belt drive.
Cleveland Openside, 26x26x8'.

SHAPERS

Gould & Eberhardt 28", gear box
Smith & Mills 32", gear box.
Smith & Mills, 14", plain crank.
Gould & Eberhardt 16" gear box drive.
Barker, 18", 4 SCD.
Averbeck, 21", 4 SCD.
Gould & Eberhardt, 24", gear box drive.
Columbia, 28" single pulley drive.

ROLLS

Niles-Bement-Pond Bending Roll, initial type, 3/8" capacity, motor driven.

WHEEL PRESSES

Niles-Bement-Pond 600 ton press, 17" ram, 8" daylight, triple plunger.

PIPE CUTTERS

Landis 2" Pipe Threading & Cutting Machine.
Wyland 4" Pipe Machine, belt drive.
Curtis 4" Pipe Machine.

PUNCH PRESSES

Robinson A-3, 2" stroke, 32 ton.
Bliss Coining Press, ⅜ stroke.

GUARANTEED MACHINERY

Cincinnati Machinery Co., Inc.
219 East Second Street
Cincinnati 2, Ohio

LATE MODEL TOOLS

BORING MILLS

#25T GIDDINGS & LEWIS Horizontal Boring, Drilling and Milling Machine
36" BULLARD Vertical Turret Lathe

LATHES

12" x 30" MONARCH Model CK Toolroom Lathe
20" x 8' AMERICAN Geared Head Lathe
20" x 8" AMERICAN Pacemaker Lathe

AUTO. LATHES & TURRETS

#5DE POTTER & JOHNSTON Automatic Turret Lathe
#6S POTTER & JOHNSTON Automatic Turret Lathe

MILLING MACHINES

NICHOLS Hand Miller
#2V REED PRENTICE VERT. Miller
#1M CINCINNATI Vert. Miller, 1941
36" x 36" x 16" INGERSOLL Adjustable Rail Planer Type Miller, 40 HP AC motor drive, one rail head, two side Heads
#00 CINCINNATI Vert. Auto. Millers

GRINDERS

9" x 18" LANDIS Type C Plain Grinder
8" x 18" CINCINNATI Plain Saddle Type Grinder
10" x 18" LANDIS Type C Plain Grinder
8" x 18" NORTON Vert. Spindle Surface Grinder
10" x 72" LANDIS Type C Hyd. Pl. Grinder, 42
16" x 96" LANDIS Type B Pl. Cyl. with Gap Bed
#16,28 BRYANT Hyd. Internal Grinder
#73 HEALD Internal Centerless Grinder
#TG-185 JONES & LAMSON Internal Thread Grinder, new
#55 HEALD Cylinder Grinder

DRILLS

3'9" CINCINNATI BICKFORD Radial, Gear Box, M.D.
5' REED PRENTICE Radial Drill
ES NATCO Mult. Spindle Drill—Hyd. Table
#3MS LELAND GIFFORD 2-spindle, hydr. fd
#425 BAKER S.S. Heavy Duty Drill
#2MS LELAND GIFFORD 4-spindle Drill

GEAR EQUIPMENT

#725A FELLOWS High Speed Gear Shaper
#36BM GOULD & EBERHARDT Gear Rougher
#12 FELLOWS Gear Shaver

MISCELLANEOUS

15" BETTS Vertical Slotter
#3L LAPOINTE Hyd. Broach, 1945
#1/2B P&W Two Spindle Reaming Machine, '44
4½" x 36" P&W Model C Thread Miller
Model H-1 MICROMATIC Hydrohoner
6: TAYLOR & FENN Spline Millers
4⅝" CONOMATIC 4-spdle automatic Screw Machines
20" CINCINNATI Hand Feed Rotary Table
36" dia. Plain Rotary Tables
P&W Upright Shaving Machine
#25-18 LITTELL M.D. Auto. Centering Reel

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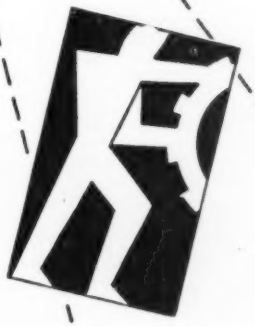

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1¼" Cone 4 spindle
1½" Cone 4 spindle
No. 454 New Britain Chucking
14"x18" Monarch Magnamatic

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3" Rockford
4" Detrick & Harvey floor type
No. 5D Moline 6 spdl. cylinder bore

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14", 4 spdl. Buffalo sensitive
15", No. 2 Avey, 1 & 4 spdl., hydr. feed
16" Sipp, 2 spindle
24", No. 48 Edlund, power feed
24" Cincinnati
No. 310 Baker
24" No. 25 Foote Burt
28" Aurora upright
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3' Carlton sensitive radial
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36 spdl. No. 2 Baush
7 spdl. Moline horiz. hydr.
12 spdl. Defiance adjustable radial
6 spindle Kent automatic
Several 2, 3 & 4 way multiple with fixed center spindles

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14", No. 5A Lees Bradner hobber
24", No. 3 Adams Farwell hobber
No. 12H G&E
No. 130 Cleveland Rigidhobber
No. 5A Lees Bradner hobber
4" Gleason spiral bevel
Gleason testers and lappers
Illinois involute tester
Red Ring shavers, tappers & speeders

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10"x18" Norton, plain & semi-auto.
10"x18" Landis hydraulic
10"x24" & 16"x72" Landis mechanical
10"x18" & 10"x50" Norton mach.

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72A3 Heald gagematic
No. 75 Heald hand feed
Nos. 72A3 & 72A5 Heald
No. 72A3 Heald, cross sliding head
No. 72A3 Heald Sizematic
Nos. 16-28 16F28 & 24-36 Bryant

GRINDERS, SURFACE

12" No. 22 Heald rotary
16", No. 22 Heald rotary
8" Pratt & Whitney rotary (tub)

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No. 1½B Kearney Trecker vertical
No. 2 Cincinnati, horiz.
12" Cincinnati plain mfg.
18" Cincinnati plain automatic
No. 4-36 Cincinnati Hydromatic
24" Cincinnati duplex
Nos. 1, 2 & 3 Kent Owens hand
No. 1 Kent Owens semi-automatic
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Ingersoll rise & fall
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48"x24"x22" Ingersoll planer
30" Newton rotary
30", 42" & 84" Ingersoll rotary
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Nos. 4 & 6 Lees Bradner univ. thread
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BULLARD 20" "New Era" Vertical Turret Lathe—4-Jaw chuck table—side head—MD

BERTRAM 42" Vertical Boring Mill—2 swivel heads—30" under tool holder—36" under crossrail—MD

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BRIDGEPORT #33B Knife Grinder—cap. 252"—traveling head—automatic wheel feed—MD—late type

LATHES

PRATT & WHITNEY Model "B" 16"x36" motor-in-base

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LODGE & SHIPLEY Model "X" 20" Selective Geared Head—54" ctrs.—taper attachment—MD—very late type

AMERICAN 36" General Purpose—134" ctrs.—12 speeds—rapid traverse—MD—late type

MISCELLANEOUS

INGERSOLL 18"x12' Two-Spindle Openside Planer—Type Keyway & Spline Miller—MD

J. T. BURR Keyway Miller—table 12½"x8½"—one horizontal and one vertical spindle—MD—late type

CHICAGO 12'x⅛" Power Apron Brake—Model 228—motor and controls—1944 machine

SAVAGE #236 Nibbler—cap. ⅜"—throat 36"—450 strokes per min.—MD—late type

BAKEWELL #1 Motor driven Tapper—cap. ⅛" to ⅞"—overhang 8½"—#2 taper

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Grinder, 72A Heald Internal, late
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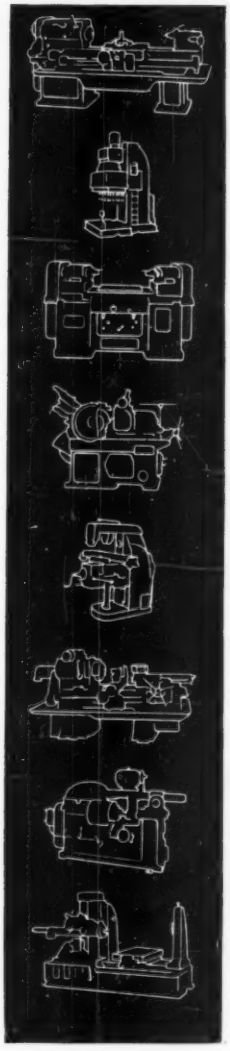

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18" LEHMAN Engine Lathe, Late
32"x34' bed LeBLOND Heavy Duty Engine Lathe, New 1943, with raising blocks to swing 48"
Model "Z", 14"x60" MONARCH Magnamatic Production Lathe, New 1937
14"x33' FAY Automatic Lathe
No. 6 WSL 12"x18" REID Smallpiece Production Lathe, New 1941
No. 9 WSL 18"x22" REID Smallpiece Production Lathe, New 1942
Model LR SENECA FALLS Lo-Swing Production Lathe, Late
Two—Model No. 616 CLEVELAND Single Spindle "Rigid-turners", New 1943
No. 2 LeBLOND Gun Boring Lathe, Late

TURRET LATHES

No. 2 BARDONS & OLIVER Geared Electric, New 1941, with bar feed
Three—No. 3 GISHOLT Universal Ram Type, New 1940-2, bar feed, collet chuck
No. 4 GISHOLT Ram Type Universal, Pre-selector head, New 1941, bar feed, collet chuck
No. 4R LIBBY Ram Type Universal, Late
Two—No. 5 GISHOLT Ram Type Universal, New 1941-2—one for chuck work, one with bar feed, collet chuck
No. 1A WARNER & SWASEY Saddle Type, collet chuck, New approx. 1935-36
No. 5D POTTER & JOHNSTON Automatic Chucking Machine, New 1940
Two—GISHOLT Simplimatic Production Lathes

BORING MILLS

42" BULLARD Vertical Turret Lathe, New-Era Type
No. 25T GIDDINGS & LEWIS Horizontal Boring Mill, New 1942
No. 32 LUCAS Horizontal Boring Mill
No. 1 DETRICK & HARVEY Floor Type Horizontal Boring Mill, 4" capacity
No. 2 DETRICK & HARVEY Floor Type Horizontal Boring Mill, 5" capacity

AUTOMATICS

Three—Model OG BROWN & SHARPE, Late
Model A—9 16" CLEVELAND, New 1943
Model A—1-1 16" CLEVELAND, New 1940
Model B—1½" CLEVELAND, New 1943
Model B—1½"-18" CLEVELAND, Shaft Machine, New 1942

DRILLS

No. 217 BAKER Drill, Late
Model H-2 BARNES Hydram Drilling, Boring & Reaming Machine, New 1942
Model H-4 BARNES Hydram Drilling, Boring & Reaming Machine, New 1942
No. 53 SUNDSTRAND Drilling and Centering Machine, New 1942

PLANERS

72" x 56" x 32' CINCINNATI Double Housing, 4 heads, belted motor drive

MILLING MACHINES

No. 5-48 CINCINNATI Hydromatic Production Mill
No. 2 SUNDSTRAND Electro-Mill, New 1941
Model 3VG REED PRENTICE Vertical Mill and Die Sinking, New 1940
Model 2HL KEARNEY & TRECKER Vertical Mill, New 1941
Two—8" x 16" HANSON WHITNEY Universal Thread Millers, Late
4½" x 12" PRATT & WHITNEY Thread Miller, Late
6" x 20" PRATT & WHITNEY Thread Miller, Late

GEAR MACHINERY

Two—3" GLEASON Spiral Bevel Gear Generators, New 1941-2
37" GLEASON Straight Bevel Gear Planer, New 1921
Two—No. 12 GLEASON Straight Bevel Gear Generator Tool Sharpeners, New 1941
10" PRATT & WHITNEY 2-wheel Hydraulic Helical Gear Grinder, Late
Model SGC 12 RED RING Precision Gear and Spline Grinder, 20" between centers, New 1942
Model No. 40 CROSS Single Spindle Gear Tooth Pointing Machine, Late
No. 15B FELLOWS Gear Burnisher, New 1943
FELLOWS Flat Top Helical Cutter Sharpener, New 1942
Five—No. 14 GLEASON Spiral Bevel Gear Grinders, New 1938-40
Five—No. 18 GLEASON Formate Zerol and Hypoid Gear Grinders, New 1947

PLAIN CYLINDRICAL GRINDERS

4" x 12" LANDIS Type "H" Plain Hydraulic Grinder, with hydraulic infeed and timer, New 1944
6" x 18" LANDIS Type CH Plain Hydraulic Grinder, Very late
Two—10" x 18" LANDIS Type "C" Plain Hydraulic Grinder, New 1941-2, hydraulic straight infeed
10" x 18" NORTON Type "C" Plain Cylindrical Grinder, New 1942, mechanical table traverse
No. 3D BROWN & SHARPE Plain Grinder, capacity 12" x 18", Late
14" x 48" CINCINNATI Plain Self-contained Cylindrical Grinder, New 1940, Filmatic Spindle Bearings

INTERNAL GRINDERS

No. 112 BRYANT Hydraulic Internal Grinder, New 1942
Several—No. 16-16, 16A-28 and 24-26 BRYANT Hydraulic Internal Grinders, New 1941-3
20" x 8" LANDIS Type "C" Hydraulic Internal Grinder, Late
No. 81 HEALD Gagematic Chuck Type Internal Grinder, Late
No. 72A3 HEALD Internal Grinder
No. 70A HEALD Internal Grinder, New 1941
No. 78 HEALD Centerless Internal Grinder, New 1942
No. 172 HEALD Hydraulic Cap Internal Grinder, New 1940, with 2" raising blocks, 40" swing

SURFACE GRINDERS

No. 5 BROWN & SHARPE Hydraulic Surface Grinder, Very Late, wet grinding, dust collector
No. 300 HANCHETT Vertical Spindle Hydraulic Surface Grinder Late, 60" table travel, magnetic chuck
24" x 72" THOMPSON Hydraulic Surface Grinder, late
14" x 36" PRATT & WHITNEY Hydraulic Vertical Grinder, New 1941, magnetic chuck
22" x 60" PRATT & WHITNEY Hydraulic Vertical Surface Grinder, Late

MISCELLANEOUS GRINDERS

OLIVER Hydraulic Automatic Face Mill Grinder, New 1948
No. 2 CINCINNATI Centerless Grinder, New 1929
Two—CINCINNATI Centerless Lapping Machines, New 1940-42
No. 620 VAN NORMAN Automatic Radius Grinder, Late
No. 47 VAN NORMAN Automatic Radius Grinder, Late
No. 49 VAN NORMAN Automatic Radius Grinder, Late
Two—Model D-86 NORTON "Crank-O-Matic" Hydraulic Crankpin Grinder, New 1944
No. 31 EXCELLO Thread Grinder, New 1943
No. TC-615 JONES & LAMSON Thread Grinder, Late
Two—No. 4T SELLERS Tool Grinder, New 1941
One—No. 6T SELLERS Tool Grinder, New 1941
No. 172 BARNES Hydraulic Honing Machine, New 1940
Three—Model H1-MICROMATIC Hydrohoners, Late

MISCELLANEOUS MACHINES

No. 2 KLING Single End Vertical Geared High Speed Punch and Shear, New 1943
No. 1 LONG ALLSTATTER Single End Punch and Shear, Late

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3¼" S.S. Cleveland Model A

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S.S. Barnes 20"—#2 M.T.
6-Sp. Foote-Burt—#2 M.T.
Multi-spindle Davis Thompson
6'15" Cincinnati-Bickford Full Univ. Radial

GEAR EQUIPMENT
#3 Gleason Spiral Bevel Gear Generator
#61A Fellows Gear Shaper
Gleason 3-Sp. Straight Bevel Gear Rougher

FURNACES
40 KW Tocco 2-station Unit with Starter
1250° Lindberg Gas Furnace
200 KW Tocco Unit—1-station—with starter

GRINDERS
#12 Bryant Internal
#205 Besly Double End—18" Discs
8" Arter Rotary Surface
30" x 160" Lobdell Roll
#26 Besly Dbl. Opposed
#6 Blount Dbl. End
Leland Faulkner Wet Tool
Stokerunit Single End Borematic
72A Heald Plain Extended Bridge
#33 Abrasive 8" x 24" Surface Grinder — Vertical Spindle
8" x 48" Jones & Lamson Automatic Thread

MILLS
#1 Kempsmith Plain Cone Head
#31 DeVleig Production Mill
24" Cincinnati Duplex
Lees Bradner Thread Mill Model HT
Hall Planetary Model C Thread

LATHES
1" Pratt & Whitney Turret
#4 Warner & Swasey Turret
#5D Potter & Johnson Turret
4" x 36" Seneca Falls Lo-Swing
9" Porter Cable Speed Lathe
16" x 30" Lodge & Shipley
18" x 54" Hendey Cone Head
18" x 72" Hendey
16" x 54" Bradford Turret Cone Head
42" x 96" Pond Engine
20" x 112" Lodge & Shipley Cone Head
24" x 72" Boye & Emmes
27" x 20' Lodge & Shipley

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6" Pratt & Whitney Vertical
20" American Shaper

MISCELLANEOUS
8' Hill & Jones Plate Bending Roll
Simplex Centering Machine
National Shape-Cutting Machine
400# Nazel Hammer
Manville 150 Ton Header
1" Ajax Upsetter
Chicago Riveter—Type PV-2A
#3 Standard Arbor Screw Press
#2 Garvin Tapper

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No. 3XA Oilgear Horiz. Hydraulic Broach
No. 12 Barber Colman Gear Hobbers
No. 3 Barber Colman Gear Hobbers (5)
30" Colburn Vertical Boring Mill
Hanchett No. 221 opposed Disc Grinder
No. 24-26 Bryant Internal Grinder, 1941
4"x12" Landis Type H Grinder, 1940
No. 73 Heald Internal Grinder, 1942
6" Pratt & Whitney Vertical Shaper
Detroit Model DH2 Brinell Tester
D-1 Colburn Heavy Duty Drill
Moline 6 Spindle Rail Drills
6A Potter & Johnston Turret Lathes
10" Hole Steinle Turret Lathe
Bridgeport Duplex Automatic Mill—1944
Sundstrand Vertical Mill, rotary table
16" Kearney & Trecker Face Mill Grinder —1942
No. 3S Cincinnati Universal Mill
36A Hanchett Rotary Grinder—1942
No. 1 to 4 Consolidated O.B.I. Presses
No. 304 Bliss Straight Side Press—1942
Erco Model 1002 Riveters 48" Throat—1943
Erco Model 279 Riveters 36" Throat—1943
No. 6 Fellows Gear Shaper
8" Sundstrand Stub Lathe
4A Warner & Swasey Turret Lathe
No. 3 S.S. Leland Gifford Drill
No. 16 Le Blond Automatic Lathe (1944)

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#12 Martin Hydraulic Marking Machine, M.D.
W.F.F. 6 Station Crank Eyelet
#2½ W.F.F. D.S.S.D. Toggle Header
BAIRD Cut & Carry Drawing Press
#72 HEALD Sizematic
24"x12' LODGE & SHIPLEY Engine Lathe, Selective Head, M.D.

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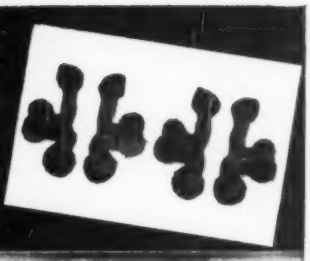
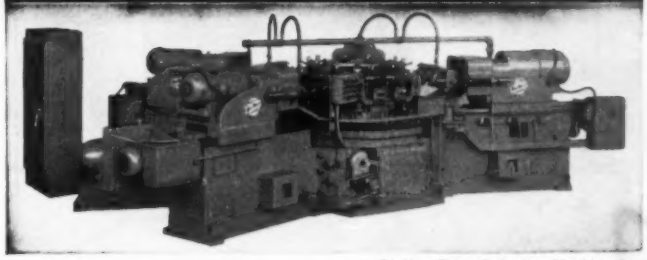
Drilling and Reaming

388 KING PIN HOLES PER HOUR





Station Type Indexing Machine for drilling and reaming king pin holes.

On a Davis & Thompson 5 Station Machine

This type MDT FIVE STATION INDEXING DRILLER has five fixtures mounted on the index table. Each of these fixtures holds 2 RH and 2 LH automobile front suspension support arms. Four ROTO-MATIC Power Heads, each having four spindles, perform the following operations:

1. Drill 53/64" dia.—Half way through.
2. Drill .823" dia. — Balance of way through.
3. End Cut Ream .8547/.8550" — Full length of hole.
4. Finish Ream .8635/.8637"—Full length of hole.
5. Load and Unload.

Two RH and two LH pieces are completed at the end of each cycle. Cycling is automatic, and, operator loads and unloads during machine cycle.

4 New Davis & Thompson Mechanical Power Heads

Included in the design of this machine are the new ROTO-MATIC Mechanical Electrical Power Heads operated through screw feed. An important safety feature of these units is the patented overload release clutches on the feed. Because of the simplicity of their design the units require a minimum of servicing.

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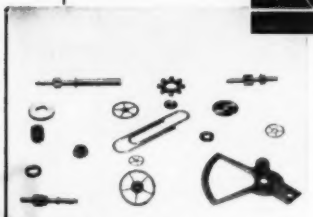

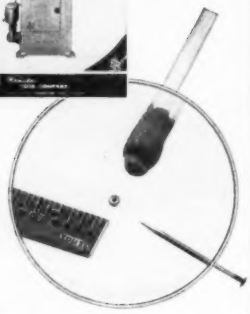

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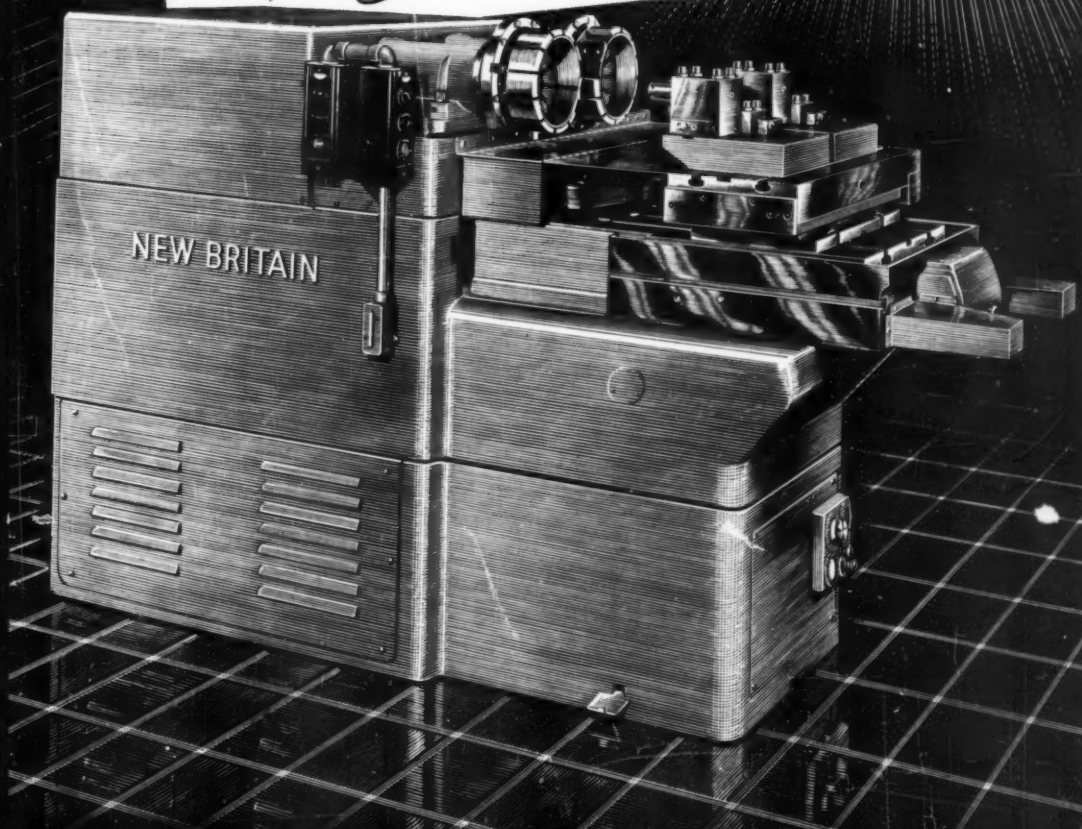

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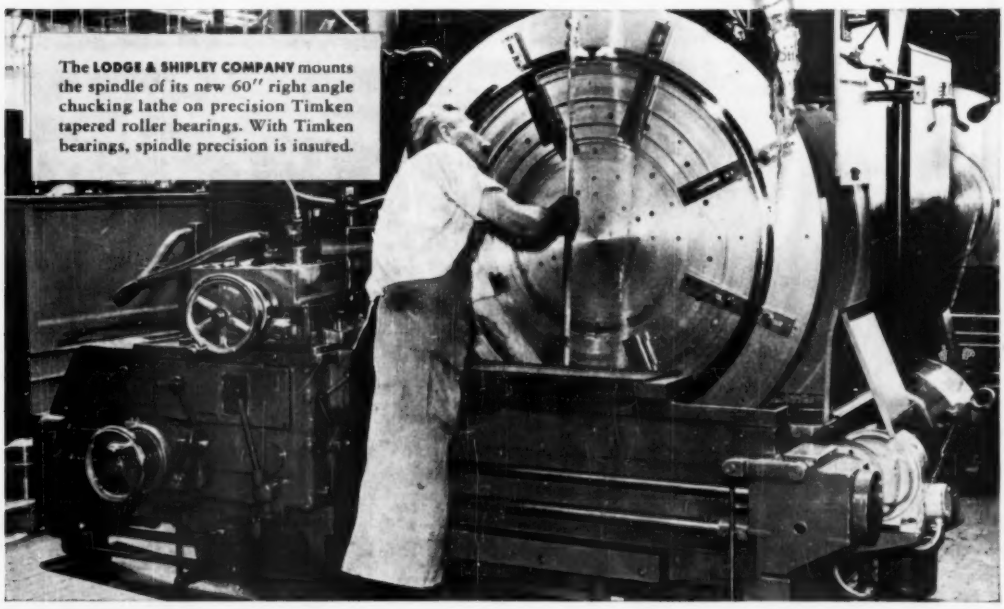

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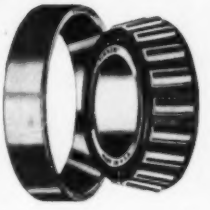

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